HITACHI

SERVICE MANUAL

TK | No.3183E

VT-M720E(UK)
VT-M722E(UK)

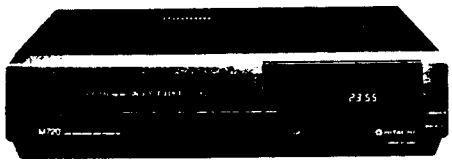
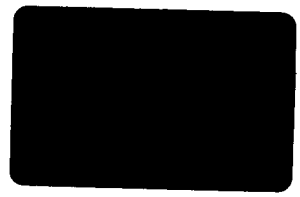


PHOTO : VT–M720E(UK)

Technical Data

SPECIFICATIONS

Format:	VHS PAL Standard
Recording:	Rotary Two-Head Helical Scan Azimuth Recording
Heads:	2 video heads (SP) ---- For VT-M720E 2 video heads (SP/LP) ---- For VT-M722E
Tape Speed:	23.39 mm/sec. (SP) ---- For VT-M720E 23.39 mm/sec. (SP) 11.7 mm/sec. (LP) ---- For VT-M722E
Tape Width:	12.7 mm
Operation Temperature:	5°C to 40°C
Video:	PAL colour (system I) & CCIR monochrome signals 625 lines
Recording Time:	240 min. with E-240 cassette (SP) ---- For VT-M720E 240 min. with E-240 cassette (SP) 480 min. with E-240 cassette (LP) For VT-M722E
Aerial Input:	UHF channels 21 – 69
RF Output:	UHF channel 37 (34 – 42 adjustable) (System I)
Video Input:	0.5 to 1.5Vp-p 75 ohm Unbalanced
Video Output:	1Vp-p 75 ohm Unbalanced
S/N Ratio (Video):	More than 43 dB
Horizontal Resolution:	Colour 260 lines
Audio	
Input:	–3.8 dBm 50 Kohm
Output:	–3.8 dBm 1 Kohm
S/N Ratio:	43 dB
Frequency Range:	70 Hz to 12 kHz
Power:	AC 240V 50 Hz
Power Consumption:	23W (including timer)
Timer:	24-hour digital indication
Cabinet Size:	370 mm(W) x 86 mm(H) x 328 mm(D)
Weight:	Approx. 5.4 kg
Accessories Included:	1 – Aerial cable 1 – Infrared remote control unit 2 – Batteries



* Design and specifications are subject to change without notice.

VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

MANUALS RELATED TO THE VT-M720E(UK)/VT-M722E(UK)

Name of Manual	Language	Manual No.	Chapters included
Technical Data	English	3183E	Chapters 1-6
Technical Information	English	3185E	—

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

December 1989 TOKAI WORKS

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SAFETY PRECAUTIONS

The following precautions should be observed when servicing.

1. Since many parts in the unit have special safety-related characteristics, always use genuine Hitachi replacement parts. Especially critical parts in the power circuit block should not be replaced with other makers' parts! Critical parts are marked ⚠ in the schematic diagrams.
2. Before returning a repaired unit to the customer, the servicing technician must thoroughly test the unit to assertain that it is completely safe to operate without danger of electrical shock.

COMPARISON WITH PREVIOUS MODEL

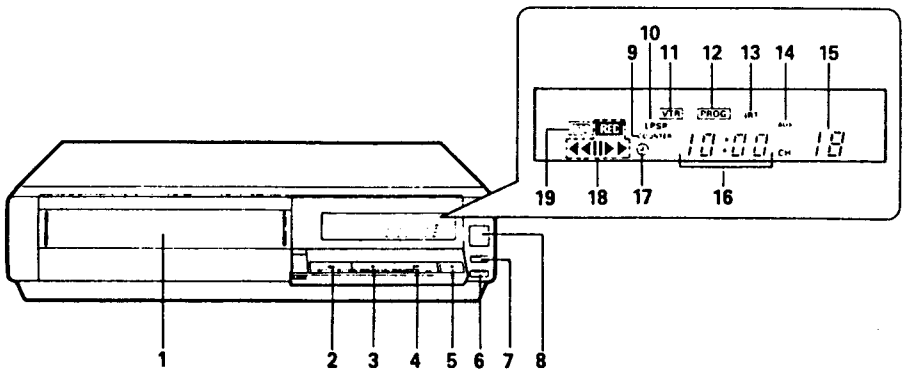
	ITEM	VT-M720E/M722E	VT-M622E
GENERAL	VIDEO HEADS	2 HEADS (SP : 30 μm)	2 HEADS (SP : 30 μm)
	BASIC CHASSIS TYPE	ZA	ZA
	CAPSTAN DRIVE	DIRECT DRIVE	DIRECT DRIVE
	CYLINDER MOTOR	THREE-PHASE OUTER ROTOR : 360Hz	THREE-PHASE OUTER ROTOR : 360Hz
	POWER SUPPLY	AC240V, 50Hz	AC240V, 50Hz
VIDEO	PAL COLOUR	I	I
	MESECAM COLOUR	NO	NO
	FRENCH SECAM	NO	NO
TUNER	TUNING SYSTEM	V.S TUNING	V.S TUNING
	CATV	NO	NO
	CHANNEL PRESET No.	99CH	79CH
	RF CONVERTER	I	I
	RF CONV. CHANNEL (34-42)	37	37
	CHANNEL PRESET BY VTR	YES	YES
	VPS	NO	NO
TIMER	REC. PROGRAM	8 PROG./1 YEAR	8 PROG./1 YEAR
	DIMMER	NO	YES
	NEW IRT	NO	YES
	BACK-UP TIMER	MORE THAN 30 MIN.	ABOUT 60 MIN.
DISPLAY	TIME (24, AM/PM)	24	24
	PROGRAM REVIEW	OSD	FL
	OSD FEATURE LIST	YES	NO
	COLOUR OSD	NO	NO
OTHER FEATURE	COUNTER MEMORY	YES	YES
	OPERATE OFF EJECT	YES	NO
	TV/VTR CONTROL	NO	YES
	AUTO HEAD CLEANER	NO	NO
	TAPE SPEED	VT-M720E : SP only VT-M722E : SP/LP	SP/LP
AUTO FEATURE	DIGITAL TRACKING	YES	YES
	AUTO TRACKING	YES	YES
	AUTO OPERATE ON	YES	YES
	AUTO PLAY	YES	YES
	AUTO EJECT	YES	YES
	AUTO REWIND	YES	YES
	AUTO REW. SHUT OFF	YES	YES
	AUTO TAPE CANCELLER	YES	YES
REMOTE CONTROL	PROGRAM SETTING	LCD	LCD
	CLOCK SETTING	LCD	LCD
	VTR 1/VTR 2	NO	YES
	PROGRAM MEMORY	YES	YES
	SP/LP KEY	YES	YES
	TV/VTR KEY	NO	NO

COMPARISON OF MAIN CONTROL ICs

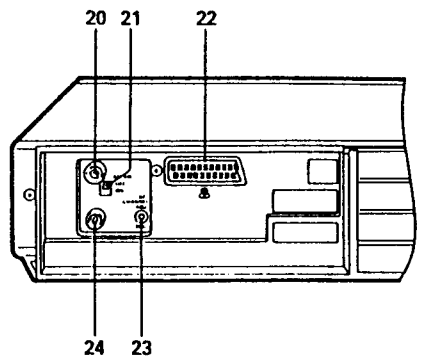
ITEM	VT-M720E/M722E		VT-M622E	
VIDEO SYSTEM				
Y PROCESS	HT7207C	(IC201)	HT4937D	(IC201)
CCD DELAY	MSM6965R	(IC202)	HN7147B	(IC206)
CHROMA PROCESS	M52057FP	(IC301)	HES8455C	(IC204)
PRE AMP				
VIDEO HEAD AMP	XRA7252S	(IC1P)	XRA7212S	(IC001)
ON SCREEN DISPLAY				
CHARACTER GENERATOR	μPD6450C	(IC1401)	———	
AUDIO				
REC/PB AMP	LA7297	(IC401)	LA7295	(IC401)
SERVO				
SERVO CONTROL	HD49747NT	(IC601)	BU2745S	(IC601)
FG AMP	BA6993	(IC602)	LA7116	(IC602)
SYSTEM CONTROL / TIMER				
SYSTEM CONTRL / TIMER μP	CXP50116-116Q	(IC751)	HD4074008A03S (System Control μP) M50957-679SP (Timer μP)	(IC901) (IC701)
TAPE LOADING DRIVE	XRA6209U4	(IC753)	BA6209U4	(IC902)
CH-TUNING SYSTEM				
TUNING INTERFACE	LA7938	(IC1501)	LA7935	(IC801)
CHANNEL MEMORY	———		M6M80021	(IC702)
POWER SUPPLY				
5V REGULATOR	RC78M05E	(IC851)	NJM7805E	(IC802)
12V REGULATOR	RC78M12FA	(IC852)	———	
MULTI. REGULATOR	———		STK5372H	(IC851)

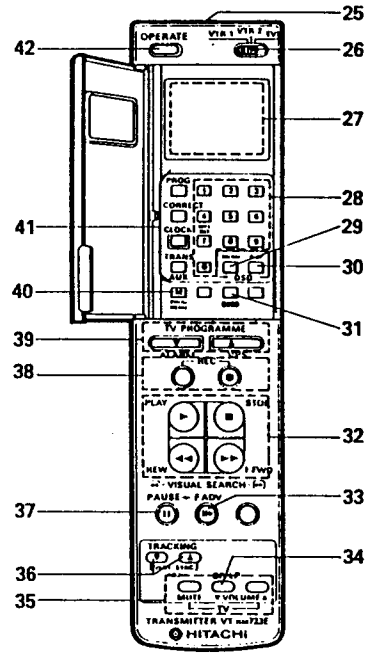
This service manual shows instructions on use of the VT-M722E(UK) model.
Refer to the instruction manuals of each destination for details.

CONTROLS AND FUNCTIONS



1. **Cassette compartment**
   Insert a cassette through the door, and loading will be completed automatically.
   Note: Power is turned on automatically when a cassette is loaded.
2. **REW (rewind) button**
   Press to start rewind.
   Press this button during playback and reverse playback picture can be viewed at high speed.
3. **PLAY button**
   Press to start play.
   Note: When a cassette (with its erase prevention tab removed) is loaded, playback starts automatically.
4. **F.FWD (fast forward) button**
   Press to activate fast forward.
   Press this button during playback and forward playback picture can be viewed at high speed.
5. **REC/IRT button**
   Press the REC/IRT button once to start recording.
   Pressing again lets you select a recording time within 4 hours. After recording for the preset time, the VTR will automatically shut off. This is convenient when you go out during recording.
6. **STOP/EJECT button**
   If this button is pressed, while the VTR is operating, the running of tape stops and all operating modes are cancelled (except for timer recording). The cassette is ejected, when this button is pressed again in STOP mode.
   Note: Power may be on or off when removing the cassette.
7. **OPERATE switch**
   Turn the system power on and off.
8. **Infrared ray receiving section**
   Receives infrared rays from the remote control unit.
9. **COUNTER indicator**
   Will light when you select the tape counter mode in the VTR's display by pressing the DISPLAY button.
10. **Tape speed indicator**
    Shows tape speed during recording and playback.
    SP – Standard play LP – Long play
11. **VTR indicator**
    Will light when the VTR power is turned on.
12. **PROG indicator**
    Lights if any programme is in the timer.
13. **IRT indictor**
    Appears when REC/IRT button is pressed twice or more for setting the IRT.
14. **AUX indicator**
    Lights when you select the AUX position by pressing the TRANS/AUX button on the remote control. AUX position is used to record or watch the programme input at the EURO jack.
15. **TV station number display**
    This shows the TV station number corresponding to the station selected.
16. **Clock display**
    Shows the present time or tape counter.
17. **Timer indicator**
    Will light when turning power off after programming.
18. **Mode indicators**
    - "REC" appears during the record mode.
    - "▷" appears during the playback mode.
    - "◁◁" appears during the rewind mode and the rewind visual search mode.
    - "▷▷" appears during the fast forward mode and the forward visual search mode.
    - "▯▯" appears during the play/record pause mode.
19. **TAPE-IN indicator**
    Lights when cassette is loaded in the compartment.
20. **AERIAL input socket**
    Conect an external aerial.
21. **ATTENUATOR switch**
    Generally set to the OFF position.
    Set it to "ON" when interference occurs in an area with a strong signal.
22. **EURO jack**
    For connection to a TV with a EURO or DIN jack using an exclusive cable. See your dealer for details.

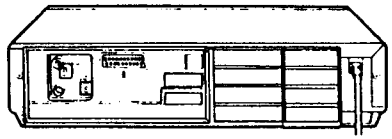




23. **RF CHANNEL control**
    Used to adjust the video channel correctly.
24. **RF OUT socket**
    Connect to TV aerial input.
25. **Transmission window**
    Transmits commands to the VTR.
26. **VTR 1/VTR 2/TV select switch**
    - Set to TV to control TV.
    - Set to VTR 1 or VTR 2 to control two VTRs.
27. **Clock/time display**
    While setting the clock/timer, this display will prompt you through the procedure. After setting the clock, the display shows the clock time.
28. **Number buttons "0" through "9"**
    Select any channel by pressing two buttons. (Press "0" and then "8" for TV station 8.) The number buttons are also used for setting the clock and programming the timer.
29. **MENU button**
    When presetting channels or recalling the timer programming etc., press this button. The menu is displayed on TV screen.
30. **DISPLAY button**
    1st Press .... Calls up the mode display on TV screen.
    2nd Press .... Defeats the display function. Also changes the VTR's display from the clock to the tape counter.
31. **0000 button**
    Used for programming the timer. And also used for counter reset button when the tape counter is displayed in the VTR's display.
32. **PLAY/STOP/REW/F.FWD buttons**
    Same as on the VTR.
33. **FRAME ADVANCE button**
    Press to view tape one frame at a time.
    Operates only after PAUSE button has been pressed.
34. **SP/LP select button**
    Select the tape speed for recording. The playback speed is automatically set to the speed used in recording.
35. **TV control buttons**
    Used to control your TV.
36. **TRACKING control buttons**
    To minimize noise in playback. May also be used during visual search to move the noise bars up or down on the screen.
37. **PAUSE button**
    Press to pause during recording.
    Press to view a still picture during playback
    Press again to release.
38. **REC buttons**
    Press two REC buttons at the same time to start recording.
39. **TV PROGRAMME buttons**
    Select the TV programmes you wish to view or record by pressing these buttons.
40. **PROG MEMO button**
    Press to store the programmed contents in the memory of the remote unit after programming the timer. This can store up to 4 programmes.
41. **Clock/timer programme buttons**
    These buttons are used for setting the clock and programming the timer.
    Note: The TRANS/AUX button is also used to select the AUX position when recording a signal from external equipment.
42. **OPERATE button**
    Same as OPERATE button on the VTR (turns operate on/off).

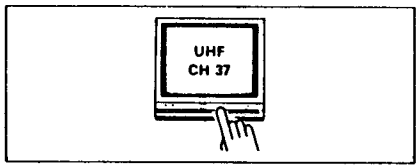
VIDEO CHANNEL SETTING

The RF converter changes the video and audio signals from a previously recorded video tape during playback to the same type of signal used for TV broadcasts. The RF converter output in this unit is pre-set prior to shipment to UHF channel 37.



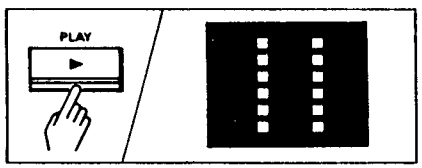
User's controls

1 Turn on the Operate switch of the TV, then set TV to UHF channel 37.



If your TV has a channel button marked "A/V", you can use this channel instead of UHF channel 37.

2 Press PLAY button on the VTR with operate switch off.



The test pattern appears on the TV screen.
Fine tune your TV until the test pattern is received clearly.
Now the video channel has been preset.

You must always select this channel with the channel selector of your TV when playing back a tape or viewing a TV programme selected with the TV PROGRAMME button of the VTR.

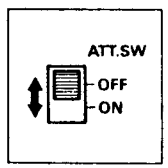
NOTE:
If it is not possible to correctly tune to the test pattern or channel 37 is used for broadcasting in your area, adjust the RF converter output with the RF channel control using a small screwdriver and readjust your TV until the test pattern is observed.

When connecting the VTR to a TV set provided with auto-tuning and the video channel cannot be set, operate as follows:

1. Remove the aerial cable from the AERIAL terminal of the VTR.
2. Press PLAY button on the VTR with operate switch off.
3. Press the Auto-tuning button of the TV.
4. Auto-tuning starts and it stops at UHF channel 37. The test pattern appears on the TV screen.
   Note: The auto-tuning indicator of the TV set changes to an exact tuning indicator.
5. Set the channel memory of the TV to ON and store the channel which was set in item 4.
   Now, the video channel of the TV has been set properly.
6. Reconnect the aerial cable to the VTR.

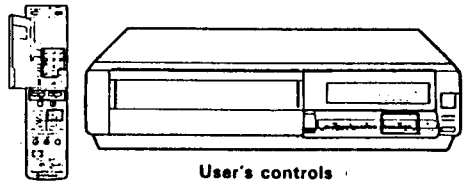
ATTENUATOR SWITCH

The ATTENUATOR switch located on the rear panel of the VTR is used to adjust the reception of the antenna signal.
If the wavy lines appear in the picture during the reception of a broadcast from a near-by TV station, it may be that the signal level is too high.
In this case, set this switch to ON to attenuate the signal level.
Normally leave this switch in the OFF position.



PRE-TUNING OF BUILT-IN TV TUNER

This VTR incorporates a complete television tuner with the required tuning controls. Once you have pre-tuned to preferred stations, you can select any of them by merely pressing the TV PROGRAMME button or Number buttons 0 – 9.

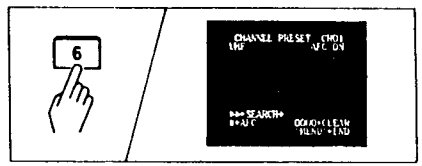


User's controls

1 Turn on the VTR and TV, then set the TV to the pre-tuned video channel.

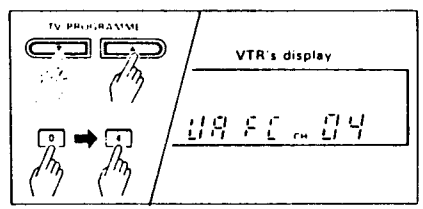
2 Aim the remote control unit at the receiver on the front panel of the VTR.

3 Press the MENU button, and then press "6" button for channel setting.



The "channel setting menu", as illustrated, will appear on TV screen. The VTR's display will also change to band indication.

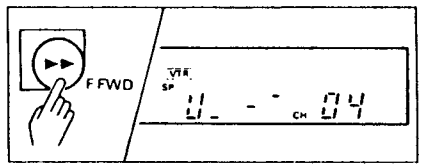
4 Press the TV PROGRAMME or two number buttons "0" ~ "9" to select the station number to be memorized.



For example, the above diagram shows that the station number 4 has been selected.

Notes:
1. Station numbers "00" through "99" can be now selected by pressing the TV PROGRAMME or two number buttons. In this case, you can use any station number.
2. When "AFC" is not displayed in the display, press the PAUSE (AFC ON/OFF) button to display "AFC".

5 Press and release the F.FWD (SEARCH) button to start tuning.



The built-in tuner starts searching from the lowest to highest frequencies.
At a station that is broadcasting, the picture appears on the TV screen. If the programme displayed is different from the station to be preset, press the F.FWD (SEARCH) button again.
At the next station, the searching will stop and the new station can be preset. Repeat this until the desired station is reached.

6 Follow the same steps as explained in steps 4 and 5 above for other stations.
You can preset up to 99 stations in memory.

7 After having completed tuning to all required stations, press the MENU button twice.

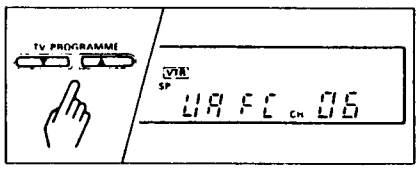
These stations preset in memory as shown in the above can be selected by the TV PROGRAMME or two number buttons "0" through "9".

AFC (Automatic Frequency Control)

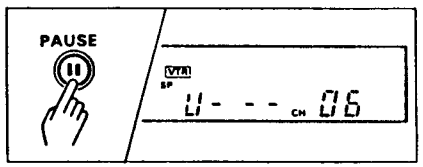
Since this unit has an AFC circuit, when a station is preset following the above procedure, the AFC turns on automatically and you can receive the signal in optimum condition.
If a TV station signal is marginal due to graininess or ghosting, the picture may sometimes be improved by manually tuning for best picture and then defeating the AFC action. To turn AFC off, follow the procedure below.

1 Follow the steps 1 through 3 of "Pre-tuning of built-in TV tuner".

2 Select the station for which you want to turn AFC off by pressing the TV PROGRAMME buttons or two number buttons "0" through "9".

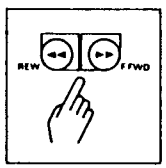


3 Press the PAUSE (AFC ON/OFF) button. "AFC" disappears from the display.



Note: Pressing the button once again will turn the AFC on.

4 Tap on the REW or F.FWD button alternately for fine tuning.



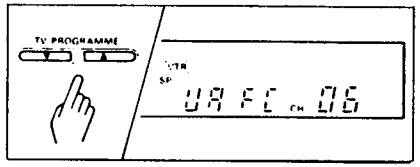
5 Press the MENU button twice to return to TV screen.

Eliminating unwanted preset stations

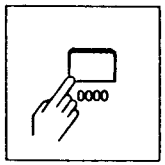
You can rearrange the desired stations by eliminating unwanted preset stations for programme up/down tuning.

1 Follow the steps 1 through 3 or "Pre-tuning of built-in TV tuner".

2 Press the TV PROGRAMME or two number buttons until an unwanted station is found.



3 Press the 0000 button.



Picture and sound will go off indicating the station has been erased from memory.

4 Repeat steps 2 and 3 until all unwanted stations have been erased.

5 After eliminating them, press the MENU button twice to return to TV screen.

Note: To add an erased station to the channel scan list, preset it again.

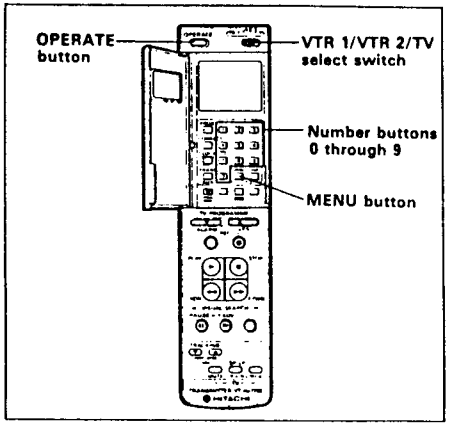
SETTING THE CLOCK

There are two ways to set the clock.
1. Setting the clock while viewing TV screen.
2. Setting the clock without viewing the TV screen.

■ Setting the clock while viewing the TV screen

Things to know before starting

- The clock uses the 24-hour system.
- When you first plug in your VTR, the clock will read "– – : – –".
- The buttons for setting the clock are on the remote control unit.
- Set the VTR 1/VTR 2/TV select switch to VTR 1 for setting the clock.
- While you are setting the clock, the "menu" display on the TV screen will prompt you through the procedures.
- If you press a wrong digit, press the MENU button and restart the procedure from the beginning.



1. Turn on the VTR and TV.
2. Be sure that the TV is set to the video channel.
3. Aim the remote control unit at the receiver on the front panel of the VTR.
4. Press the MENU button. The "menu", as illustrated, appears on the TV screen.

Original menu

5. Press "1" button to set the clock. The display prompts you to set the hour.

6. Set the hour by pressing two number buttons on the remote control unit and two more for the minute (for example, 0 2 1 6 for 2:16). The display prompts you to set the date.

7. Set the date by pressing six digits in order of day, month and year (for example, 1 7 0 3 9 0 for 17th of March, 1990). The day of the week will appear when you have entered all six digits for the date.
   NOTE: Always press "0" before single-digit months and days.

8. Press the MENU button to start the clock. The display resumes the "original menu".
   NOTE: Now the display on the VTR will show the correct time.
9. Press the MENU button once again to return to the TV screen.

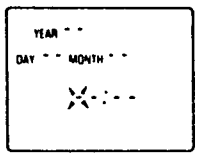
NOTES:
1. If you input an illogical time or date (13th month for example), this will not be accepted.
2. The clock must be set to the correct time before programming the timer for unattended recording or using the Instant Recording Timer (IRT) feature.
3. The display of Clock Setting procedures will resume the "original menu" if not further steps are followed in the setting for about 1 minute.
4. If power is interrupted for more than one minute, "– – : – –" will appear on the display and Timer and Programming will need to be reset.

■ **Setting the clock without viewing the TV screen**

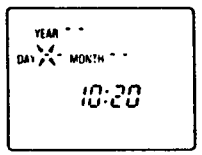
Things to know before starting

- The buttons for setting the clock are on the remote control unit.
- Set the VTR 1/VTR 2/TV select switch to VTR 1 for setting the clock.
- While you are setting the clock, the display panel on the remote control unit will prompt you through the procedure.
- The OPERATE switch of the VTR may be on or off for setting clock.
- Always press "0" before a single-digit hour, minute, day, month and year.
- If you press the wrong digit during clock setting, press the CORRECT button repeatedly until the incorrect digit flashes then enter the correct digit.
- You have about one minute to do each step in the procedure. If you do not proceed to the next step within this time, all entries are erased and you must start over.

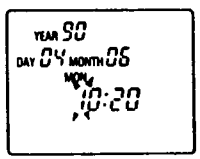
1. Press CLOCK button.



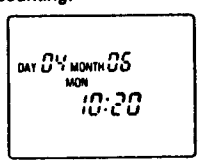
2. Set the clock.
   For example, press 1 0 2 0 for 10:20.

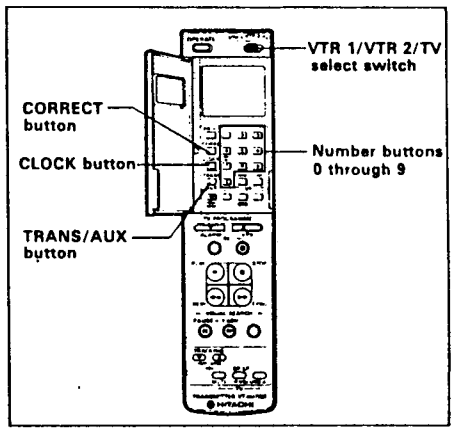


3. Set the date.
   For example, press 0 4 0 6 9 0 for the 4th of June, 1990.
   The day of week appears automatically.

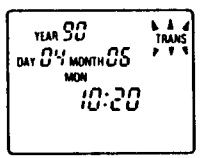


4. After setting the date, press CLOCK button.
   The year disappears from the display panel and the clock starts counting.

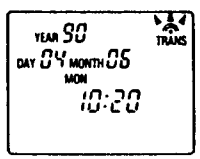




5. Press CLOCK button once more.
   The year appears along with "TRANS" blinking.



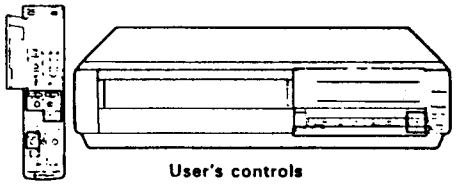
6. Press TRANS/AUX button while aiming the remote control unit at the receiver on the VTR.



- The transferred clock appears on the display of VTR.

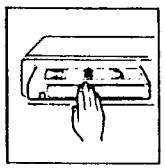
Note: If you correct the clock in the VTR's display after transmitting the information to the VTR, follow steps 5 and 6 above.

RECORDING TV PROGRAMMES

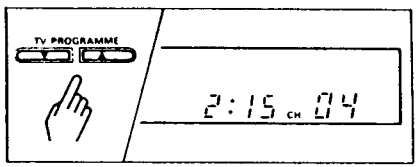


User's controls

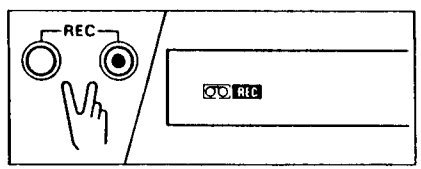
1 Insert a cassette.
Note: Be sure to check that the erase prevention tab is not missing. If it is removed, the VTR is set to playback mode automatically.



2 Select the programme to be recorded by pressing the TV PROGRAMME or two number buttons.



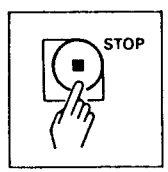
3 Press the REC button on the VTR or two REC buttons on the remote control unit at the same time.



Now, recording starts.

Note: If a cassette without its erase prevention tab is loaded and the REC buttons are pressed, the cassette is ejected automatically.

4 After the recording has been made, press the STOP button.

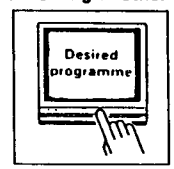


To view a programme while recording it

You can view a programme while recording it by merely selecting the video channel with your TV.

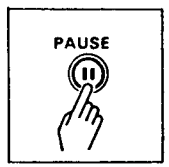
To record one programme while viewing another

You can record one programme while viewing another by merely selecting the programme you want to view on your TV. The recorded programme can be viewed later at your convenience.

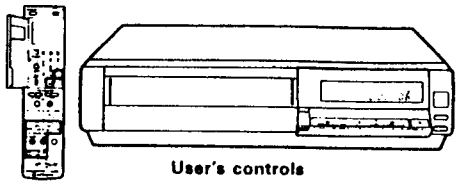


Notes:

1. If you want to avoid recording unwanted material, press the PAUSE button. Press the PAUSE button again to release the pause mode. To prevent tape damage, do not leave the unit in the pause mode for more than 5 minutes.
2. If you want to change programmes while in the record mode, press the PAUSE button then select the desired programme.
   Press the PAUSE button to release the pause mode.
3. Your TV does not have to be on to make a recording because the VTR records TV programmes without the aid of your TV. It is only used for monitoring.



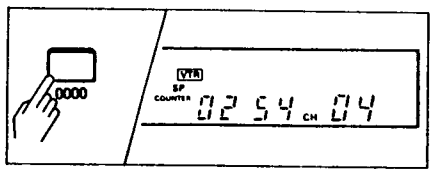
SPECIAL CHARACTERISTICS



User's controls

Tape counter

This indicates the amount of video tape transported as a number. Press the DISPLAY button once or twice to display the tape counter in the display then press the 0000 button to set the counter reading to "0000" when starting recording or playing back.

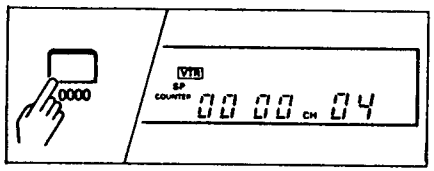


Note the number on the tape counter at the beginning and end of each programme you record. This will allow you to use the counter to find the desired programme later.

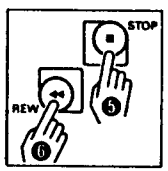
Counter memory function

This is useful if there is a section of tape you want to view immediately after recording or if you want to return to the same point several times.

1. Begin recording or playing back a tape.
2. Press the DISPLAY button once or twice to display the tape counter in the display.
3. At the point where you want playback to begin, reset the tape counter to "0000" by pressing the 0000 button.



4. Continue to play or record.
5. Press the STOP button when recording or playback finishes.
6. Press the REW button.

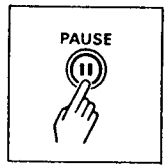


The tape will automatically stop at the position where "0000" was preset.
Actually, so that you won't miss the very first part of the programme, the tape will stop slightly prior to "0000", at a reading of approximately "9997".

Note: The counter memory function will also operate in the fast-forwarding mode.

Still playback

Press the PAUSE button to stop the picture on the screen during playback.
Press the PAUSE button again to reset to normal playback or the STOP button to stop the tape.

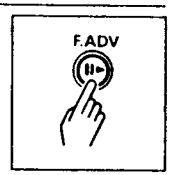


Notes:

- If you see vertical shaking on the TV screen in the still playback mode, press either TRACKING button (▲ or ▼) to minimize shaking.
- When the still playback mode continues for about 5 minutes, the VTR switches to the stop mode automatically to prevent damage to the tape.
- The playback picture will contain some noise in the still playback mode.

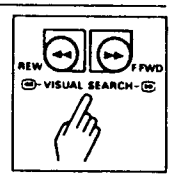
Frame advance

When you hold the F.ADV button down during the still playback mode, tape will be played back frame by frame. It operates only after PAUSE button has been pressed.



Visual search

This allows you to view the played back picture at high speed in both the forward and reverse directions.
Press either the REW or F.FWD button during playback. Pictures can be viewed at high speed in either the forward or reverse direction. Press the button again (or press PLAY) button to return to normal playback or press the STOP button to stop tape.

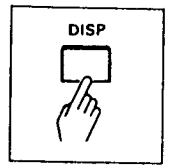


Note: The playback picture will have some horizontal noise bars in the picture.

OSD (On-Screen Display) function

Whenever you turn on your VTR or change the status – from stop to play, play to stop, change stations, etc. – the new status of the VTR is displayed on the TV screen automatically. You can manualy call up the VTR status display to the screen when required by pressing the DISPLAY button. The display will disappear from the screen in a few seconds.

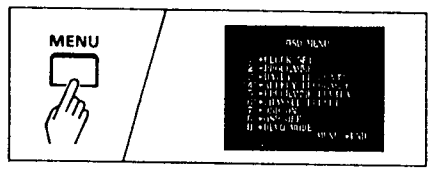
- Press the DISPLAY button once to call up the mode display.
- Press the button twice to clear the mode display and also the VTR's display changes from clock to tape counter.



Note: When tapes recorded by other VTRs are played back, the mode display may shake up and down.

If required, follow the procedure below so no display will appear on the TV screen.

1. Press the MENU button on the remote control unit. The OSD menu appears on the TV screen.



2. Press button "8". The OSD function is switched off. When this is selected, no operation mode will be displayed on the TV screen if the VTR is operated.

Note: Press button number 7 in step 2 above when you want OSD to reappear.

OSD effects demonstration

1. If you want to demonstrate OSD effects, press button "9" when the OSD menu is displayed on TV screen.
   The pictures demonstrating the OSD effects are each displayed for about 20 seconds.
2. To stop the demonstration, press MENU button.

Automatic rewind

The VTR automatically rewinds the tape when the end of the tape is reached.
Note: To prevent accidental erasure, the VTR does not rewind the tape after timer recording.

Rewind shut off

If the OPERATE switch is pressed during rewind operation, power will be turned off automatically after the tape has been completely rewound.
Note: If the counter memory is turned on, the VTR will stop rewinding and switch off at the specified position.

TIMER RECORDING

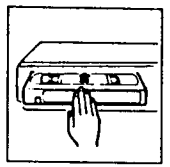
The programmable electronic clock/timer permits the unattended recording of 8 preselected programmes within a period of 1 year, including the same programme(s) repeated on every day and the same programme(s) every week. It turns the unit on and off and selects the programme automatically.

Preparations for timer recording

- Your TV does not have to be on to make a recording because the VTR records TV programmes without the aid of your TV. It is only used for monitoring.

1 Make sure that the clock shows the present time correctly.

2 Insert a cassette.
Be sure to check that the record safety tab is not missing. If the record safety tab is missing, recording will not begin.



3 Programme the timer.
See next page.

4 Turn the OPERATE switch off.
If a cassette with its safety tab snapped off is inserted, it will be ejected automatically when power is turned off. In this case, insert a cassette with its safety tab in place or cover the hole with cellophane tape.

■ Programming the timer for unattended recording

For unattended recording the timer needs to know what day to make the recording, the **time to start**, the **time to stop**, and the **channel to be recorded.**

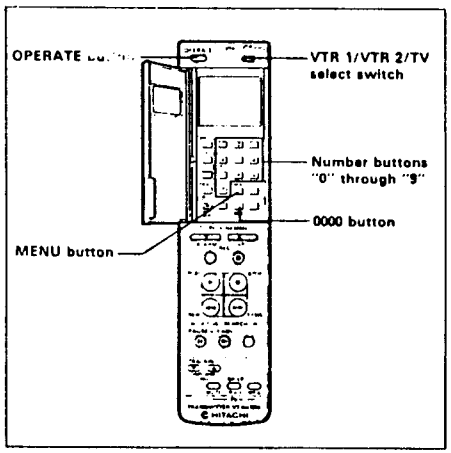
There are two ways to programme the timer.
1. Programming while viewing the TV screen.
2. Programming without viewing the TV screen.

■ Programming while viewing the TV screen

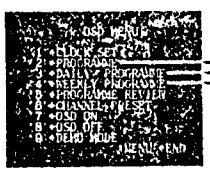
Things to know before starting

- While you are programming the timer, the "menu" display on the TV screen will prompt you through the procedures.
- You can correct an error in the programme any time before the last step by pressing 0000 button repeatedly until the digit to be corrected becomes flashing and then enter the correct digit.
- The programming will automatically resume the "original menu" if no further steps are followed in programming for about 1 minute.
- The "original menu" will be switched to the TV screen automatically if it is left on without further steps for about 1 minute.
- Set the VTR 1/VTR 2/TV select switch to VTR 1 for programming the timer.

1. Turn on the VTR and TV.
2. Be sure that the TV is set to the video channel.
3. Aim the remote control unit at the receiver on the front panel of the VTR.



4. Press the MENU button. The "menu", as illustrated, appears on the TV.



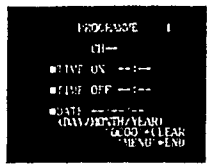
for recording up to 8 programmes on a single day or over the days within a period of 1 year.

for recording up to 8 programmes at the same time(s) Sunday through Saturday within a period of 1 year.

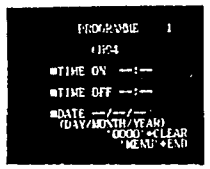
for recording up to 8 programmes on certain days of every week within a period of 1 year.

Note: Any one of these programme modes or any combination thereof (up to 8 programmes in total) may be selected. A typical example of a "Normal" programme is demonstrated below.

5. Press button "2". The display will prompt you to select the channel to be recorded.



6. Press two digits for the channel to be recorded (for example, "0" "4" for channel 4). The display will prompt you to enter the recording start time.

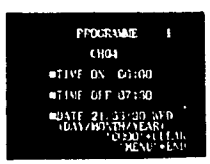


7. Press four digits, two for the hour and two more for a minute (for example, "0" "6" "0" "0" for 6:00). The display will prompt you to select the stopping time.

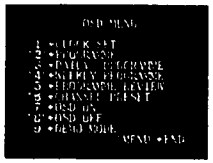
   Note: Always press "0" before a single digit hour and minute.

8. Press four digits, two for the hour and two more for the minute (for example, "0" "7" "3" "0" for 7:30). The display will prompt you to select the date.

9. Press four digits (two for the day and two for the month) (for example, "2" "1" "0" "3" for begin recording on 21th of March). The year and day of the week are displayed automatically.



10. Press the MENU button to enter your programme and return to the programming "menu" display.



Additional programmes may be entered by repeating Steps 5 through 10.
If you have no other programmes to enter, press the MENU button once again.
The display returns to the TV screen.

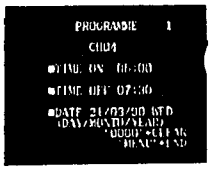
11. Press OPERATE button to turn off the VTR power.

NOTE:
You can preset up to eight programmes. If you attempt to input a ninth programme, the following display appears on the TV screen showing that you cannot enter the programme.

RECALLING THE PROGRAMME

1. Follow Steps 1 through 4 of "Programming the timer for unattended recording".
   The programming "menu" appears on the TV screen.

2. Press "5" button (Programme Review).
   The TV screen will display for 10 seconds the information you entered for the lowest programme number. Then the display changes to the next higher programme number and so on, until all programme information has been displayed.
3. Press "5" again if you want to view the next programme information immediately.
4. When you finish reviewing the programmes, press the MENU button twice to switch off the on-screen display.



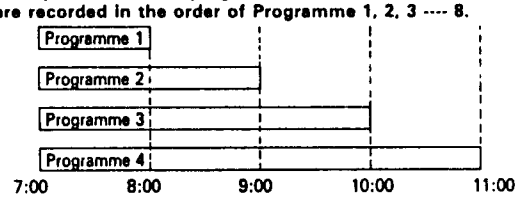
CLEARING ("ERASING") INFORMATION FROM A PROGRAMME

1. Follow Steps 1 through 4 of "Programming the timer for unattended recording".
   The programming "menu" appears on the TV screen.
2. Press "5" button (Programme Review).
   The TV screen will display for 10 seconds the information you entered for the lowest programme number. Then the display changes to the next higher programme number and so on, until all programme information has been displayed.
3. Press "5" again if you want to view the next programme information immediately.
4. Press 0000 button when the programme information you want to clear is displayed.
5. Press the MENU button twice to switch off the on-screen display.

Note:
- Normal programme is cleared automatically when the timer recording is finished, but daily and weekly programmes remain in the timer even after the timer recording is finished.

PROGRAMME PRIORITY

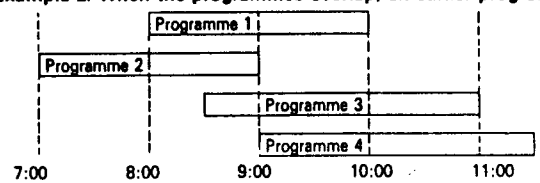
Example 1: When the programme start time is the same among the programmes on the same day, they are recorded in the order of Programme 1, 2, 3 ---- 8.



7:00 – 8:00 for Programme 1
8:00 – 9:00 for Programme 2
9:00 – 10:00 for Programme 3
10:00 – 11:00 for Programme 4

Programme 1 is executed as programmed, and Programme 2 as illustrated after Programme 1, and Programme 3 as illustrated after Programmes 1 and 2, and Programme 4 as illustrated after Programmes 1, 2 and 3.

Example 2: When the programmes overlap, an earlier programme has priority.



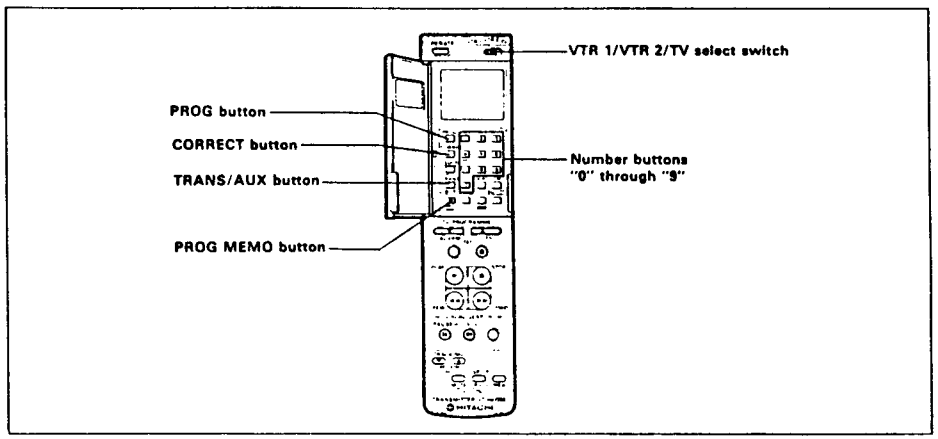
7:00 – 9:00 for Programme 2
9:00 – 10:00 for Programme 1
10:00 – 11:00 for Programme 3
11:00 – for Programme 4

Programme 2 is executed as programmed, and Programme 1 as illustrated after Programme 2, and Programme 3 as illustrated after Programmes 2 and 1, and Programme 4 as illustrated after Programmes 2, 1 and 3.

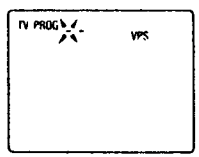
■ Programming without viewing the TV screen

Things to know before starting

- Set the VTR 1/VTR 2/TV select switch to VTR 1 for programming the timer.
- The OPERATE switch on the VTR may be on or off for programming the timer.
- Always press "0" before a single-digit channel, hour minute etc.
- You have about one minute to do each step in the procedure. If you do not proceed to the next step within this time, all entries are erased and you must start over.
- While you are programming the timer, the display panel on the remote control unit will prompt you through the procedures.
- You can correct an error in the programme any time before the last step by pressing CORRECT button repeatedly until the digit to be corrected becomes flashing and then enter the correct digit.

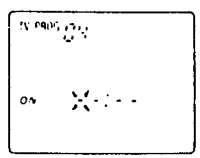


1 Press PROG button.



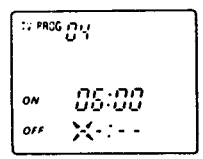
Note: When you press the PROG button, "VPS" will appear. Ignore these letters because they are not concerned with the VTR operation. If it is confusing, press the TV PROGRAMME (▲) button after you input the TV station number in step 2 to erase the letters "VPS".

2 Select the TV station number to be recorded.
For example, press 0 4 for the TV station 4.

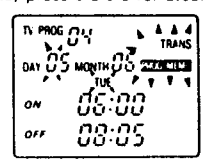


Note: Press TRANS/AUX button when recording video and audio from external equipment.
"AUX" appears in the display panel in place of a station number.

3 Select the start time.
For example, press 0 6 0 0 for 6:00.

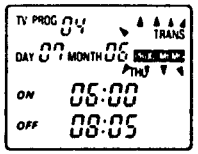


4 Select the stop time.
For example, press 0 8 0 5 for 8:05.

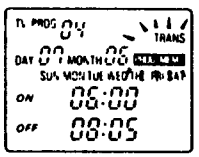


5 Select date for recording.

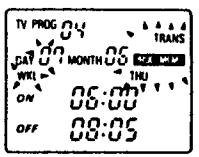
- To record on a single day up to one year ahead:
  For example, press 0 7 0 6 to begin recording on the 7th of June.



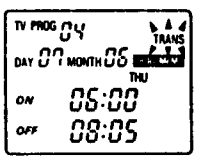
- To record at the same time every day of week:
  Press "7" (WKL/DLY) button once to display all days. Then select the first recording date.



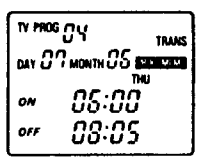
- To record on a specified day at the same time each week: Press "7" (WKL/DLY) button repeatedly until the desired day of the week you want to record appears.



6 Now, programming has been completed for one event. Press PROG MEMO button to store this programme in the memory of the remote control. See "Storing programmes in the memory of remote control" on the next page for details.



7 After programming, press TRANS/AUX button while aiming the remote control unit at the receiver on the VTR.



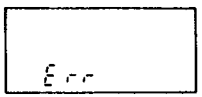
8 If you want to programme another programmes, perform steps 1 through 7.

9 Press CLOCK button to switch the display panel on the remote control unit back to the clock calendar display.

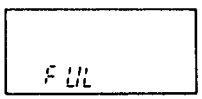
10 To activate the VTR's timer and make a recording at the preselected time, be sure to turn the system power off. Of cource a cassette which has an intact safety tab must be inserted.

Operating notes

- If you select a TV station which is not displayed if the TV PROGRAMME button on the remote control is pressed, "Err" is displayed by the VTR when the TRANS./AUX button is pressed. In this case, correct the channel then transfer them to VTR.



- Check the display on the VTR before transferring data. If TRANS./AUX button is pressed when all the programme numbers that the VTR can store are occupied, a "FUL" indication will appear in the Display on the VTR and the information tranferred will be rejected.



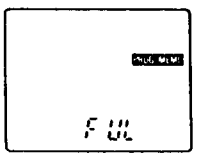
■ To check programming in the memory of the VTR

■ To clear a programme from the VTR memory

Storing programmes in the memory of the remote control

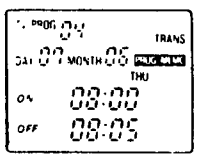
This remote control unit can store programmed information in its memory for up to 4 programmes. Press PROG MEMO button in step 6 on page 22 to store the details of the programme being displayed on the remote control in its memory. When storing the programme in memory, PROG MEMO lights to inform you. If you store a programme in memory, you can check or correct it easily.

Note: If you attempt to store another programme after storing 4 programmes, PROG MEMO does not appear in step 4. If PROG MEMO button is pressed at this time, the indication below appears to inform you that the memory is full.

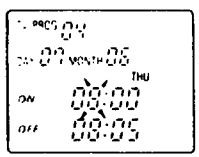


Correcting a programme in memory of the remote control unit

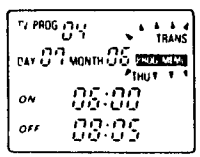
1. Press PROG MEMO button to display the incorrect programme.



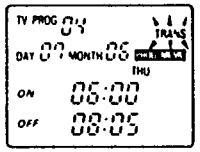
2. Press CORRECT button repeatedly until the incorrect digit flashes.



3. Press buttons 0 – 9 to input the correct digit.
4. After the correction, press CORRECT button until "TRANS" and PROG MEMO flash.



5. Press PROG MEMO button to store the programme.

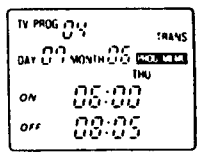


6. Press TRANS/AUX button to transfer the programme to the VTR.

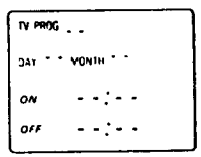
Note: The previously stored incorrect programme is rewritten with the new programme. However, when the incorrect programme has already been transferred to the VTR, it is stored in the memory of the VTR. Clear the programme following "Clearing information from a programme"

Clearing a programme from memory of the remote control unit

1. Press PROG MEMO button when the remote control is displaying the present time to display the programme to be cleared.



2. Press 0000 button.
   The programme will be cleared.



Note: When a programme is cleared from the memory of the remote control, it is not cleared from the VTR's memory. To clear the programme from the VTR's memory, see "Clearing information from a programme"

Alarm function

When the present time shown by the remote control unit and the start time of the programme stored in memory of the remote control match, the alarm function works and a buzzer sounds for about 5 seconds. This is convenient for you to check whether timer recording starts correctly or not. You can switch the alarm function on and off by pressing the TV PROGRAMME (▼) ALARM button when you are setting or correcting the clock. The alarm function is on when alarm indicator is lit and off when it is off.

DISASSEMBLY

1. IDENTIFICATIONS AND LOCATIONS OF CIRCUIT BOARDS

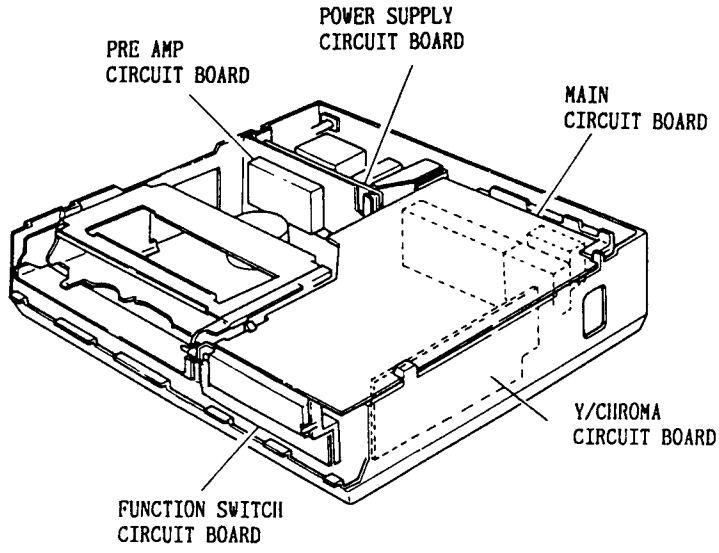


Fig. 1-1 Top View

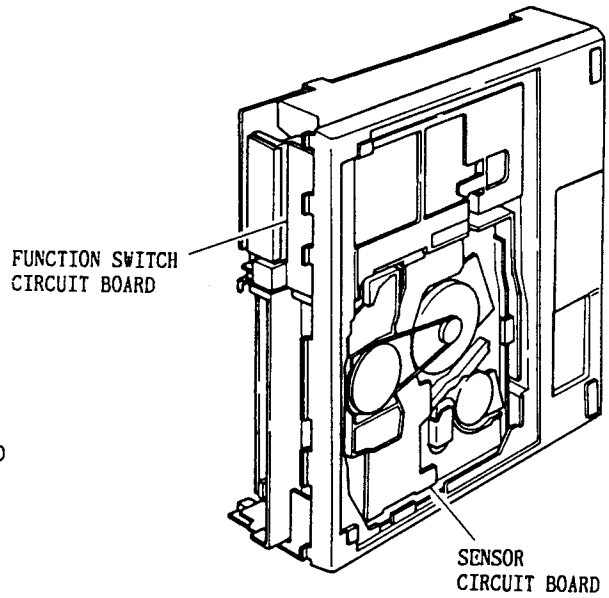


Fig. 1-2 Bottom View

2. IDENTIFICATIONS AND LOCATIONS OF MAIN MECHANICAL COMPONENTS

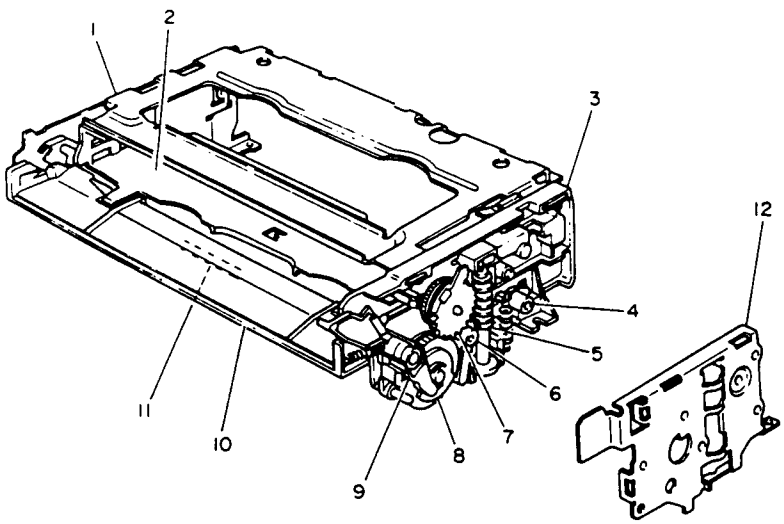


Fig. 2-1 Cassette Loading Mechanism

1. CHASSIS HOLDER
2. CASSETTE HOLDER
3. GEAR BRACKET
4. SWITCH LEVER B
5. FL WORM GEAR
6. SWITCH LEVER A
7. WORM WHEEL
8. DRIVE GEAR
9. DOOR ARM
10. FRONT HOLDER
11. SHAFT PIN
12. CASSETTE DOOR
13. SIDE CHASSIS

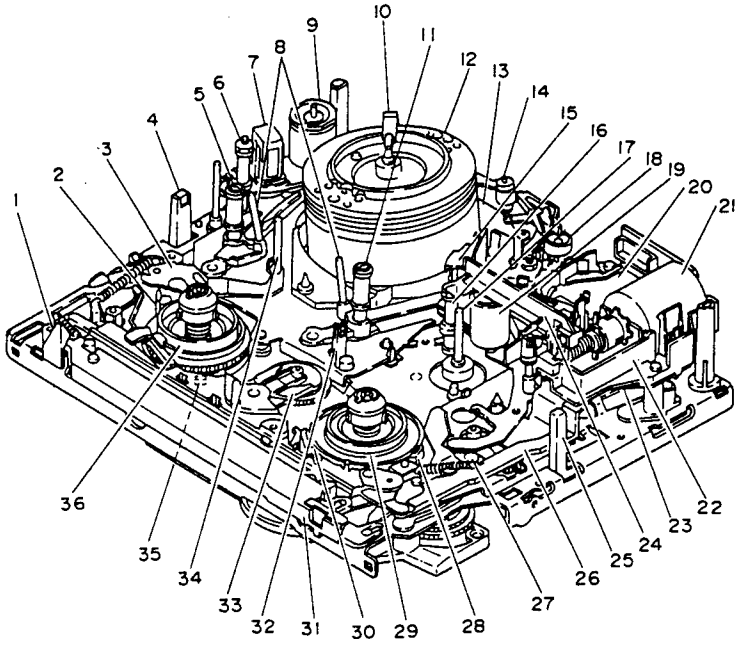


Fig. 2-2 Tape Transport Mechanism -Top View

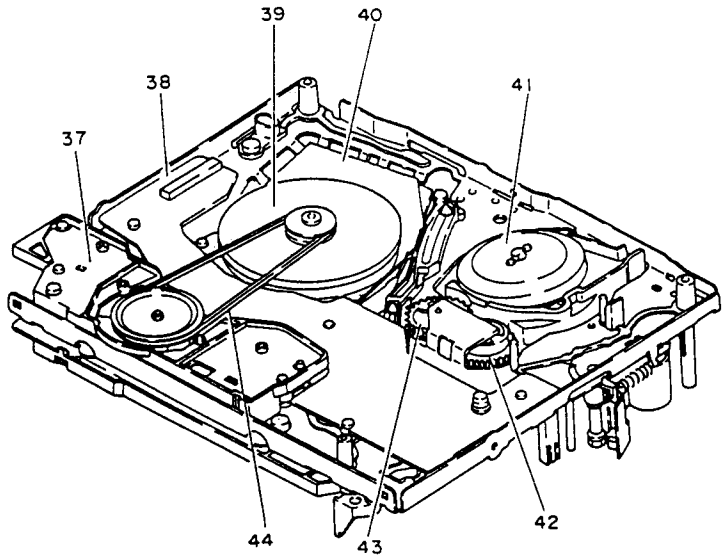


Fig. 2-3 Tape Transport Mechanism -Bottom View

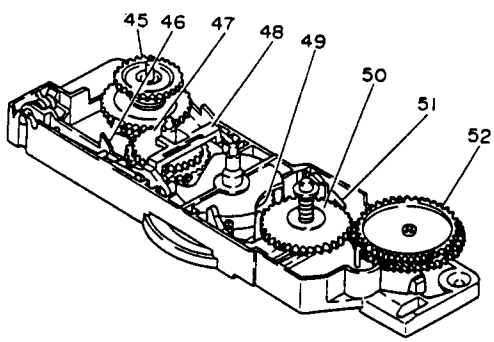


Fig. 2-4 Tape Transport Mechanism - Clutch Base Section

1. SAFETY ARM
2. TENSION BAND ASSEMBLY
3. TENSION ARM
4. SUPPLY REEL SENSOR
5. SUPPLY GUIDE ROLLER
6. SUPPLY GUIDE POLE
7. FULL ERASE HEAD
8. INCLINED GUIDES
9. IMPEDANCE ROLLER
10. STATIC DISCHARGE BRUSH
11. TAKE-UP GUIDE ROLLER
12. CYLINDER MOTOR ASSEMBLY
13. CYLINDER BASE
14. HEAD CLEANING ARM ASSEMBLY (For VT-M728E)
15. AUDIO/CONTROL (A/C) HEAD
16. TAKE-UP GUIDE POLE
17. CAPSTAN SHAFT
18. HEAD CLEANING BRACKET ASSEMBLY (For VT-M728E)
19. PRESSURE ROLLER ASSEMBLY
20. MECHANISM STATE SWITCH
21. LOADING MOTOR ASSEMBLY
22. LOADING MOTOR HOLDER
23. LOAD BRACKET ASSEMBLY
24. CASSETTE LID OPENER
25. TAKE-UP REEL SENSOR
26. BRAKE LINK ARM
27. PRESSURE ROLLER OPERATION ARM
28. TAKE-UP BRAKE ASSEMBLY
29. TAKE-UP REEL DISK
30. TAKE-UP MAIN BRAKE
31. SLIDER BLOCK ASSEMBLY
32. END LAMP
33. REEL DRIVE IDLER
34. TENSION POLE
35. SUPPLY MAIN BRAKE
36. SUPPLY REEL DISK
37. CLUTCH BASE ASSEMBLY
38. SENSOR P.C.B
39. CAPSTAN MOTOR ASSEMBLY
40. CAPSTAN MOTOR P.C.B
41. CYLINDER MOTOR ASSEMBLY
42. SUPPLY LOADING GEAR
43. TAKE-UP LOADING GEAR
44. REEL BELT
45. TAKE-UP GEAR
46. CLUTCH ARM
47. CHANGE GEAR
48. CHANGE ARM
49. TAKE-UP PULLEY
50. FL CHANGE GEAR
51. FL CHANGE ARM
52. RELAY GEAR

3. CASE REMOVAL
1. Top Cover
2. Bottom Cover
3. Front Panel

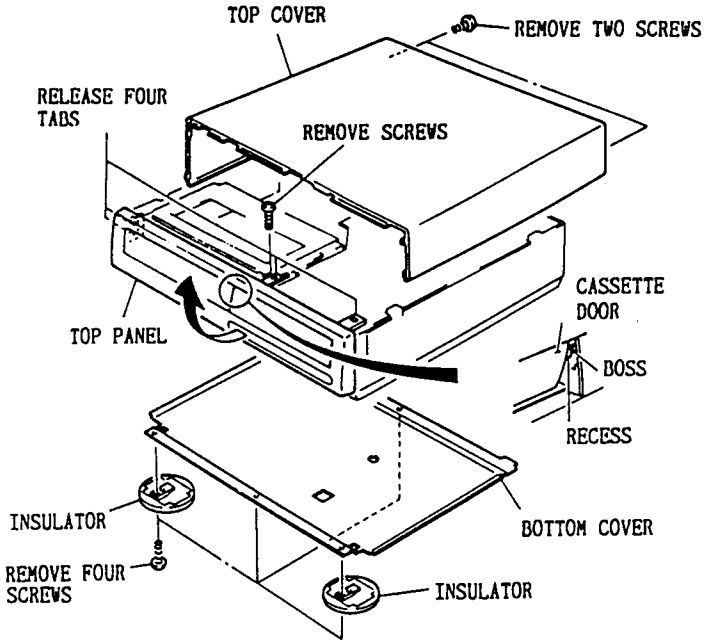


Fig. 3-1

4. Cassette Door
Note : Components to remove previously.
- Top and bottom cover
- Front panel

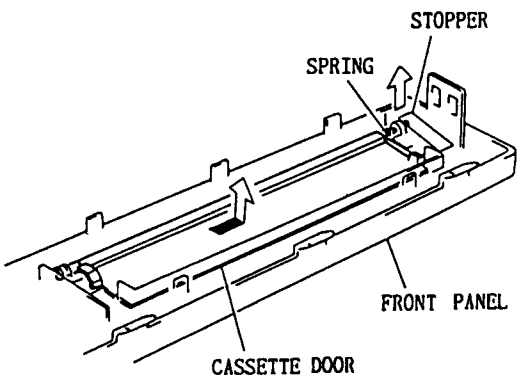


Fig. 3-2

5. Rear Panel
Note : Components to remove previously.
- Top and bottom covers
- Front panel
- Main circuit board

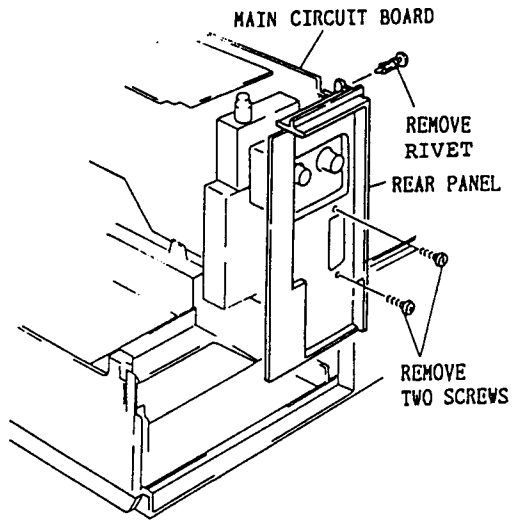


Fig. 3-3

4. CIRCUIT BOARD REMOVAL
Note : Remove the following components previously before removing the circuit boards.
- Top and bottom covers
- Front panel

1. Main Circuit Board

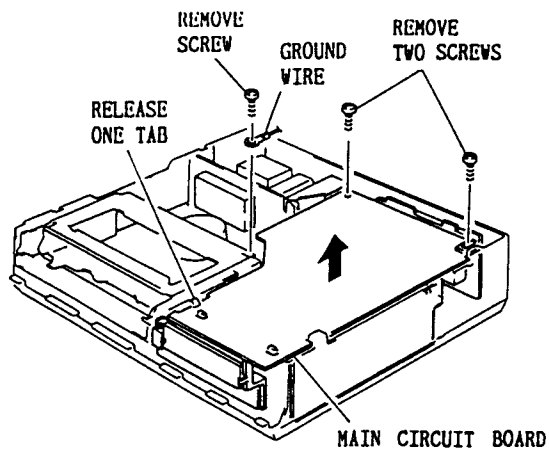


Fig. 4-1

2. Function SW Circuit Board

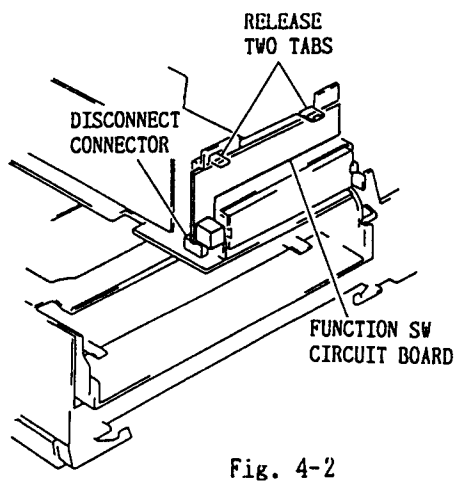


Fig. 4-2

3. Pre Amp Circuit Board

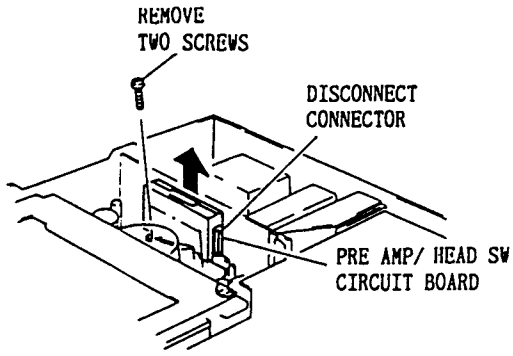


Fig. 4-3

4. Sensor Circuit Board

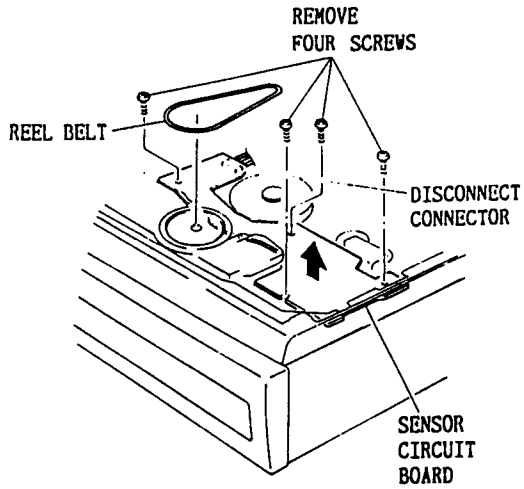


Fig. 4-4

5. CASSETTE LOADING MECHANISM REMOVAL

Note

☆ Components to remove previously.
- Top and bottom covers
- Front panel
- Capst B + Control circuit board

☆ Remove the parts of the cassette loading mechanism in the order listed.

1. Cassette Loading Mechanism Assembly and Cassette Door

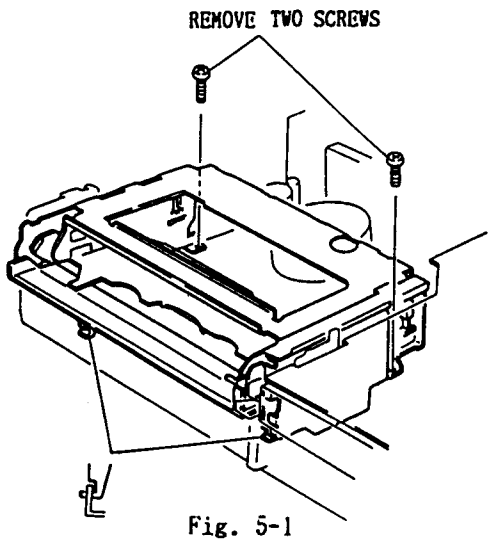


Fig. 5-1

2. Loading Gear Assembly, Chassis Holder, Cassette Holder Assembly, Front Holder

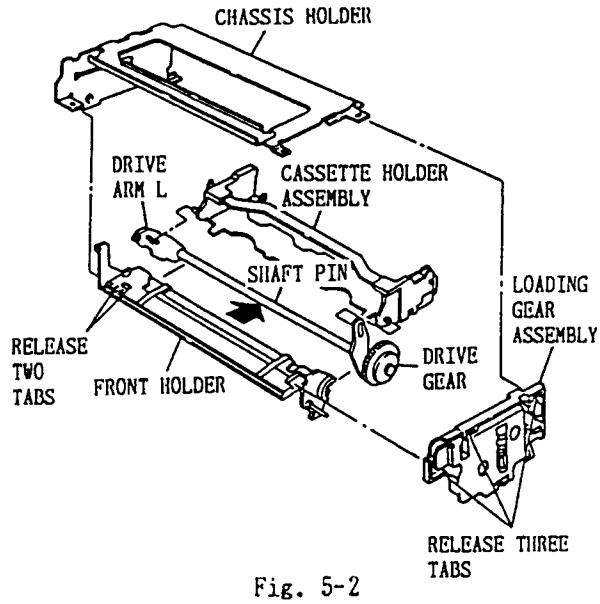


Fig. 5-2

3. Cassette Holder Base and Cassette Holder L,R

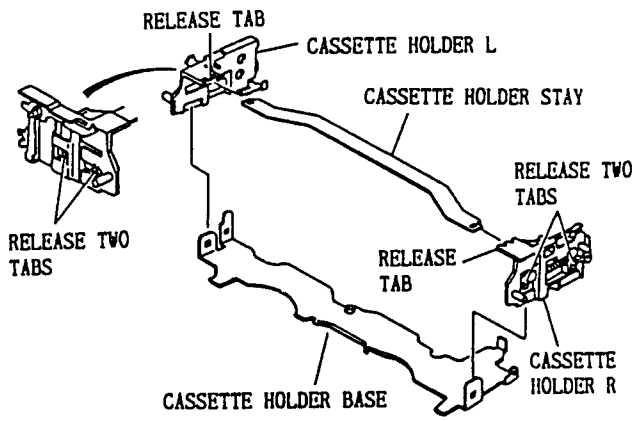


Fig. 5-3

4. Side Chassis, Door Arm, Worm Wheel, FL Worm Gear, Switch Lever A/B

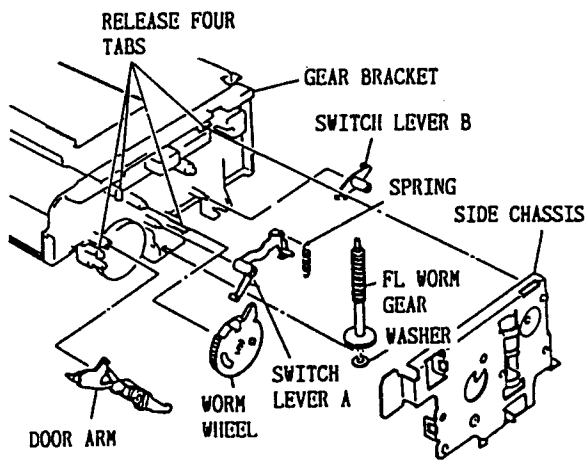


Fig. 5-4

5. Chassis Holder Reinstallation
6. Loading Gear Assembly Reinstallation

Notes

Assemble the Cassette Loading Mechanism by the reverse procedure to removal.

Care should be taken in the following areas:

☆ Check that the two bosses of the Cassette Holder are inserted into the groove in the left side of the chassis holder (Fig. 5-5).

☆ When reinstalling the loading gear assembly, check that the two bosses of the Cassette Holder are inserted into the grooves (Fig. 5-6).

☆ Align the mark on the Worm wheel Gear with the mark on the Drive Gear (Fig. 5-6)

☆ Check that the boss of the Cassette Switch Lever is set to the Cam section of the Drive Gear (Fig. 5-6).

☆ When reinstalling the Cassette Door, check that the boss of the door arm is inserted into the groove in the Cassette Door (Fig. 5-6).

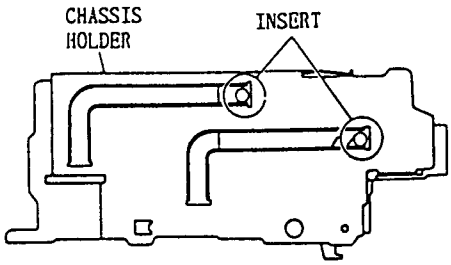


Fig. 5-5

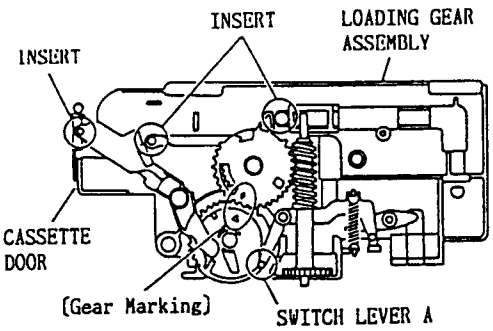


Fig. 5-6

6. MAIN MECHANICAL COMPONENTS REMOVAL

Note

☆ Components to remove previously.
- Top and bottom covers
- Front panel

1. Video Head (Upper Cylinder), Cylinder Motor Assembly

Note

☆ Use extreme care when removing the upper cylinder. Do not touch the video heads during servicing.

Caution when reinstalling

☆ Align the video heads connected to the blue connector of the upper cylinder with the arrow on the lower cylinder.

Adjustment after reinstalling

☆ Head Switching Point

☆ Adjustment after replaceing the cylinder

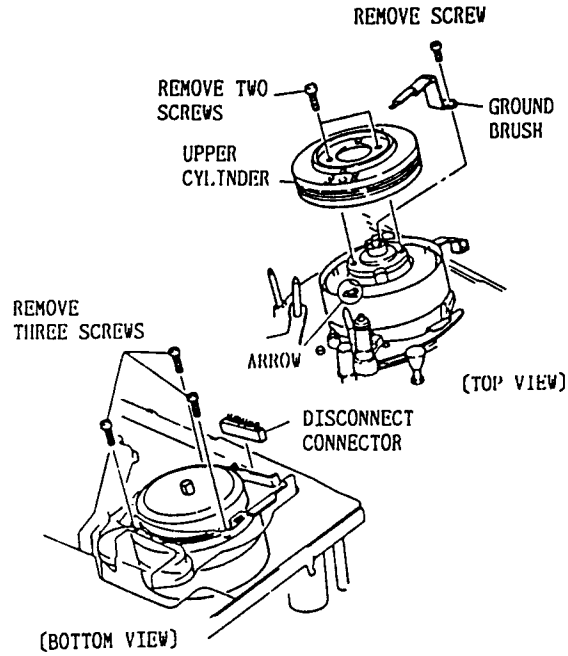


Fig. 6-1

2. FE (Full Erase) Head / Impedance Roller, A/C (Audio/Control) Head

Cautions when reinstalling the A/C Head

☆ Hook the spring between A/C head base and chassis.

☆ It should be 6.3mm between head base (1) and head base (2).

Adjustment after reinstalling the FE Head/ Impedance Roller

☆ Guide Poles Height

Adjustment after reinstalling the A/C Head

☆ A/C Head

☆ X Value

☆ Audio Bias Level

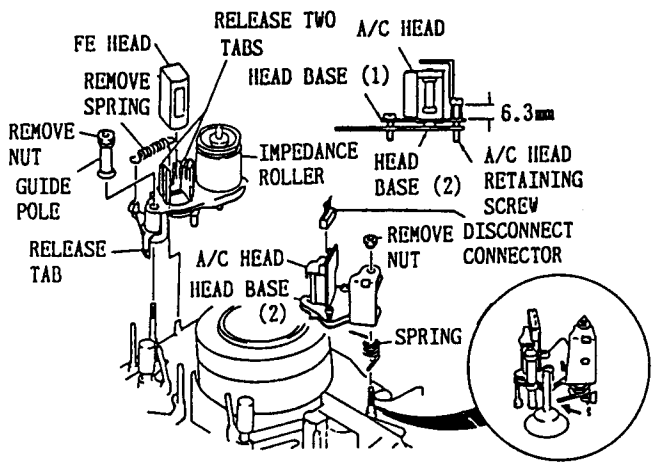


Fig. 6-2

3. Head Cleaning Arm Assembly, Head Cleaning Bracket Assembly (For VT-M728E)

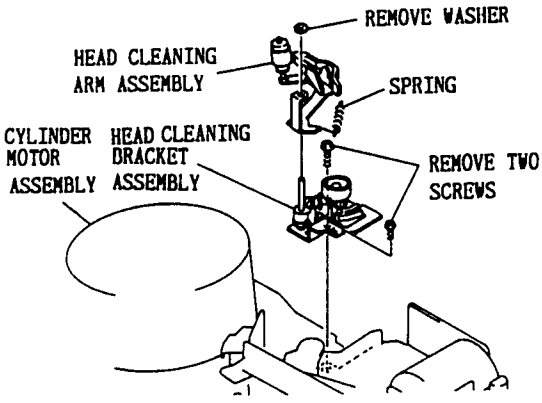


Fig. 6-3

4. Capstan Motor Assembly

Caution when reinstalling

Clean the capstan shaft.

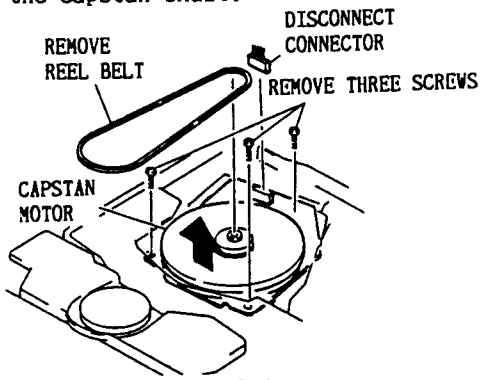


Fig. 6-4

5. Tension Arm/Tension Band

Adjustment after reinstalling

☆ Tension Arm Position

☆ Back Tension

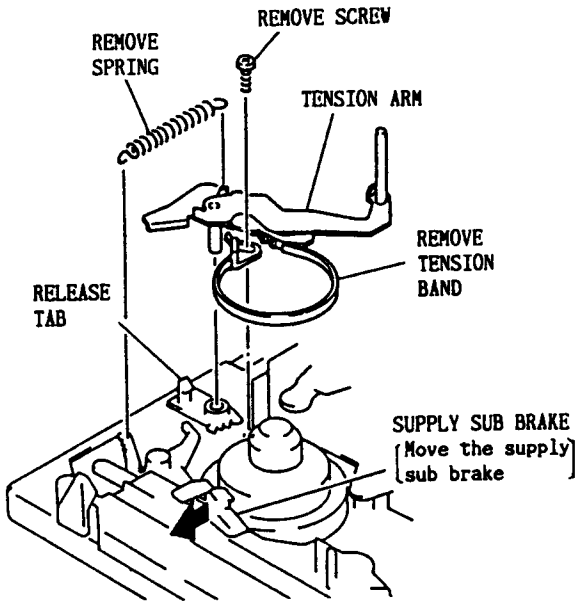


Fig. 6-5

6. Slider block Assembly, Reel Drive Idler

Caution when reinstalling

☆ Assemble both sub brakes while pushing them in the direction of arrow (A) and then pressing arrow mark (B).

☆ Check that the bosses of the load bracket are inserted into each slider.

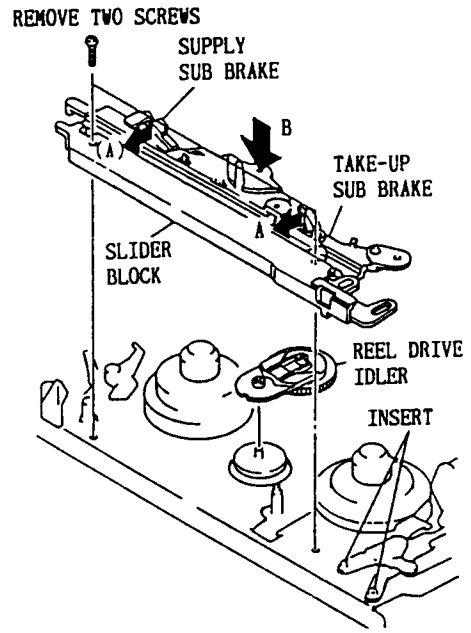


Fig. 6-6

7. Supply and Take-up Reel Disks

Adjustment after reinstalling

☆ Reel Disk Height

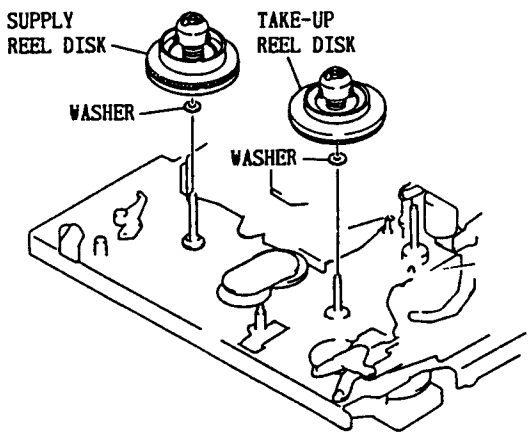


Fig. 6-7

8. Pressure Roller Assembly, Supply and Take-up Guide Poles, Supply and Take-up Guide Rollers

Adjustment after reinstallation

☆ Guide Pole Height

☆ Guide Roller Height

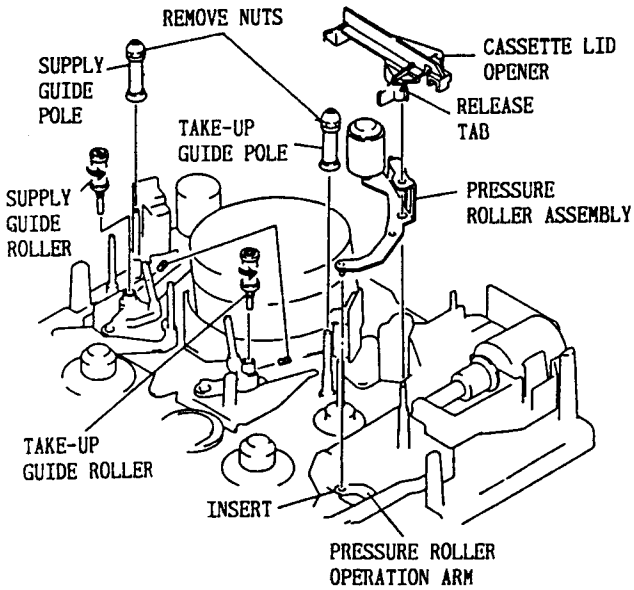


Fig. 6-8

9. Load Block Assembly, Brake Link Arm, FS Brake Arm

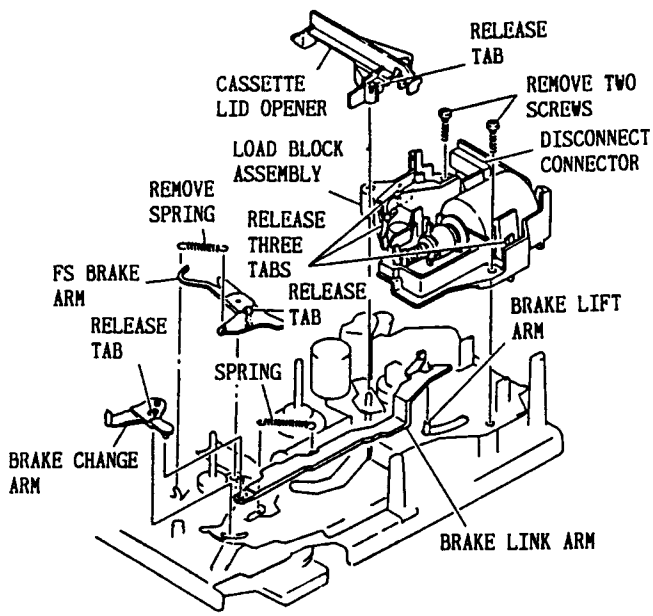


Fig. 6-9

10. Load Bracket Assembly

Caution when removing

1) Remove the screw and turn the worm wheel counterclockwise to move the lift arm in the direction of the arrow until the guide poles are in the loaded positions.

2) Pull the boss of the loading slide gear out of the holde in the lift arm and lift the load bracket assembly up to remove it.

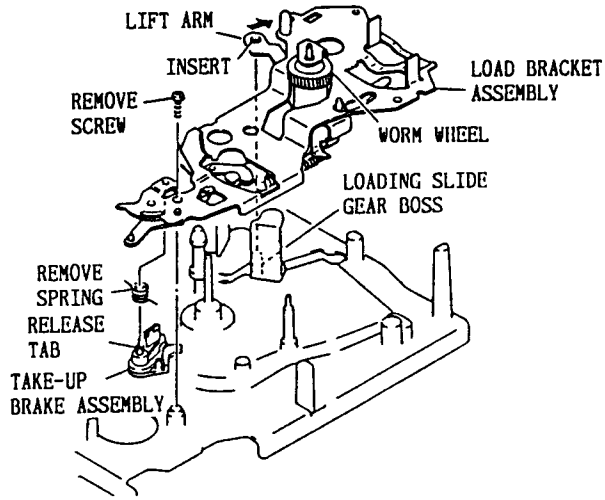


Fig. 6-10

Removal in item 11 and later is described as if the load bracket assembly has been removed.

11. Brake Operation Arm, Mode Gear, Worm Wheel, Pressure Roller Operation Arm, Mode Change Arm, Brake Lift Arm

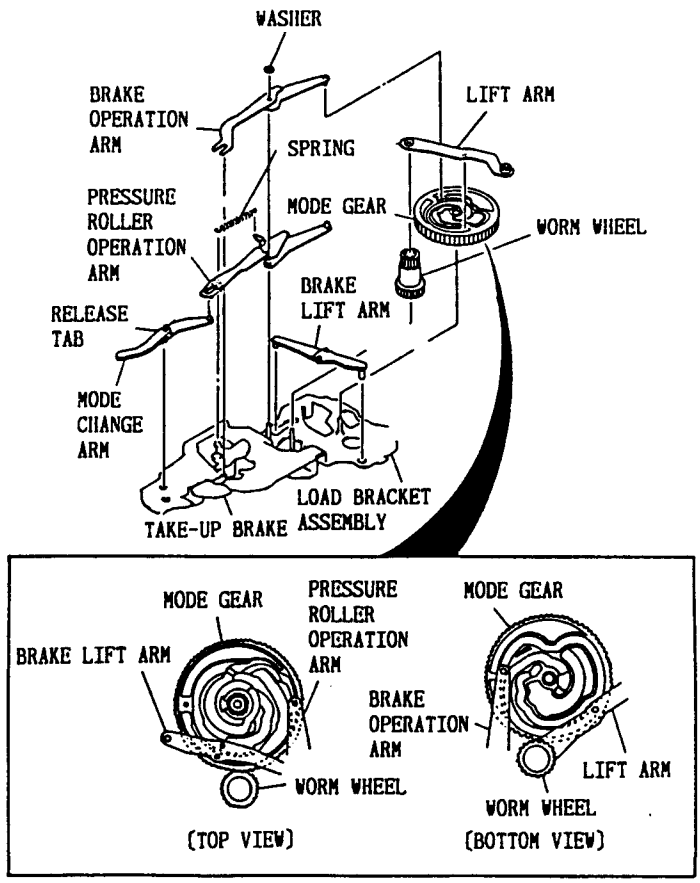


Fig. 6-11

12. Cylinder Motor Base, Supply and Take-up Loading Arms

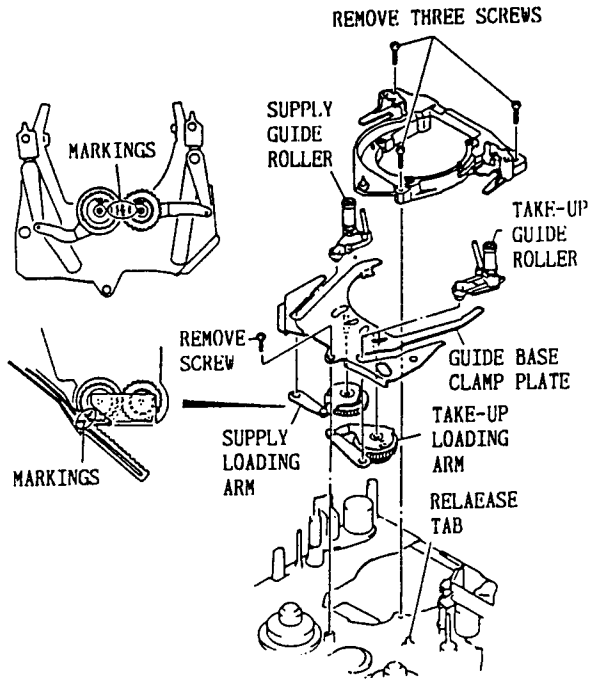


Fig. 6-12

13. Take-up Pulley and Clutch Base Assembly

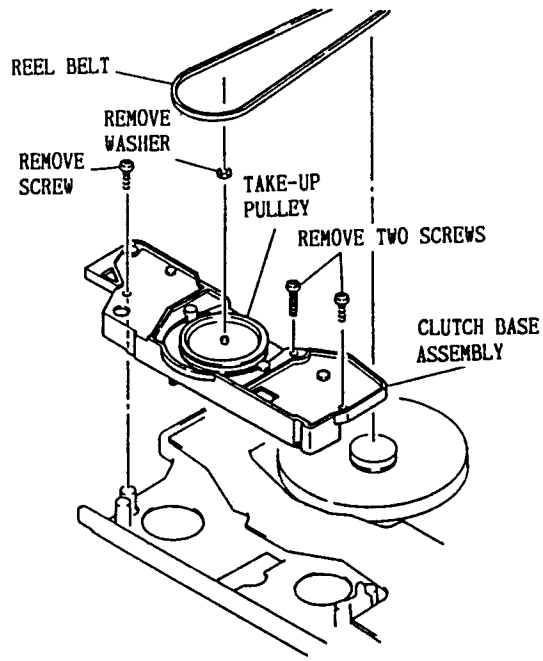


Fig. 6-13

13. Take-up Gear, Change Arm, Change Gear, Relay Gear, FL Change Gear and FL Change Lever

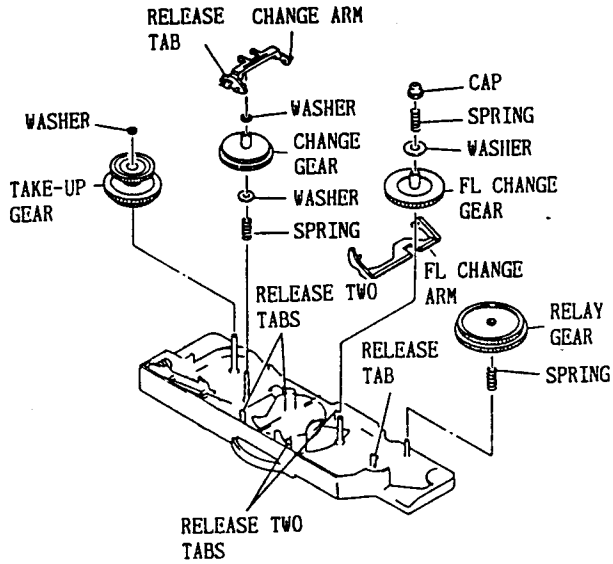


Fig. 6-14

7. ATTACHING THE ROTOR MAGNET PLATE TO THE CYLINDER MOTOR

Caution when installation

☆ The rotor magnet plate attached to the base of the cylinder motor (illustrated as the top in the figure below) is equipped with magnetic poles. If it is attached in reverse, the VTR will not operate normally. Attach it correctly following the procedure below.

How to attach

☆ There are holes in the rotor magnet plate and cylinder plate attaching bracket. Attach the rotor magnet plate so that hole (A) in the plate and hole (B) in the bracket across from the screw holes.

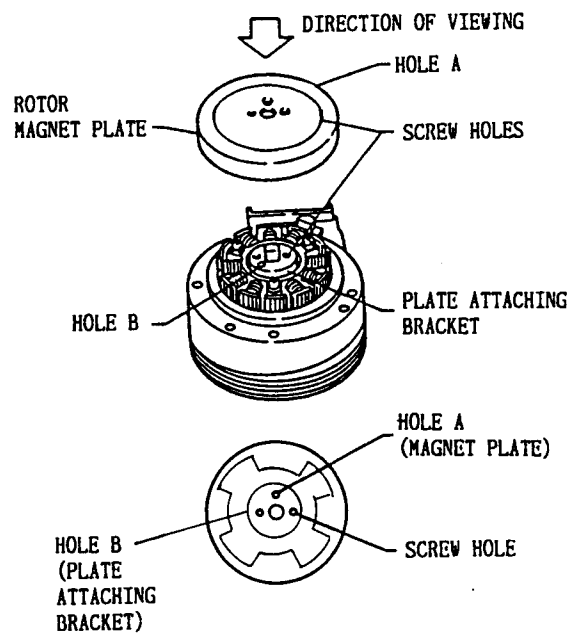


Fig. 7-1

ELECTRIC CIRCUIT ADJUSTMENTS

Test equipment and tapes necessary for adjustment

1) Dual-trace oscilloscope
2) Colour bar generator
3) VTVM
4) DC voltmeter
5) Frequency counter
6) Monitor TV
7) Alignment tape (MH-2)
8) Blank tape

Cautions on adjustments

1) If there are no special instructions, the following conditions apply:
   - Oscilloscope probe: 10:1
   - Oscilloscope synchronization: Auto-Sync
   - Tracking control: Electrical centre
2) When making more than one adjustment, make adjustments in the order listed.

To set tracking to the centre

When "Tracking control: Electrical centre position" is specified, centre the tracking as follows.

☆ Press the EJECT button to remove the cassette and re-insert it.

Resetting the microprocessors

All microprocessors installed in the unit will be reset once the AC power cord is removed from the AC outlet. However, the timer microprocessor is not reset for about 1 hour because it is backed up by the power backup circuit.

Servicing Position

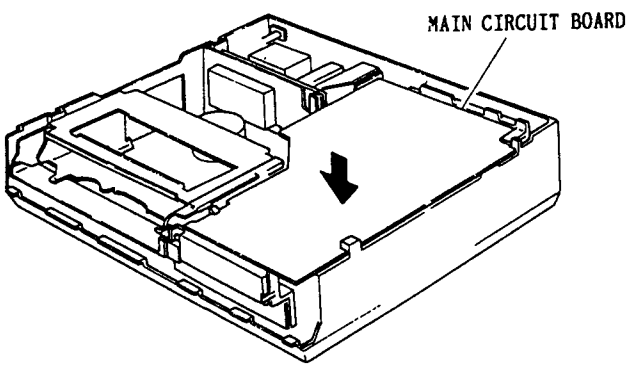


Fig. 1-1 Main Circuit Board

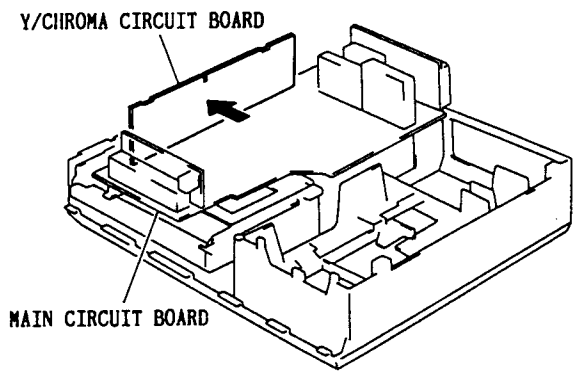


Fig. 1-2 Y/Chroma Circuit Board

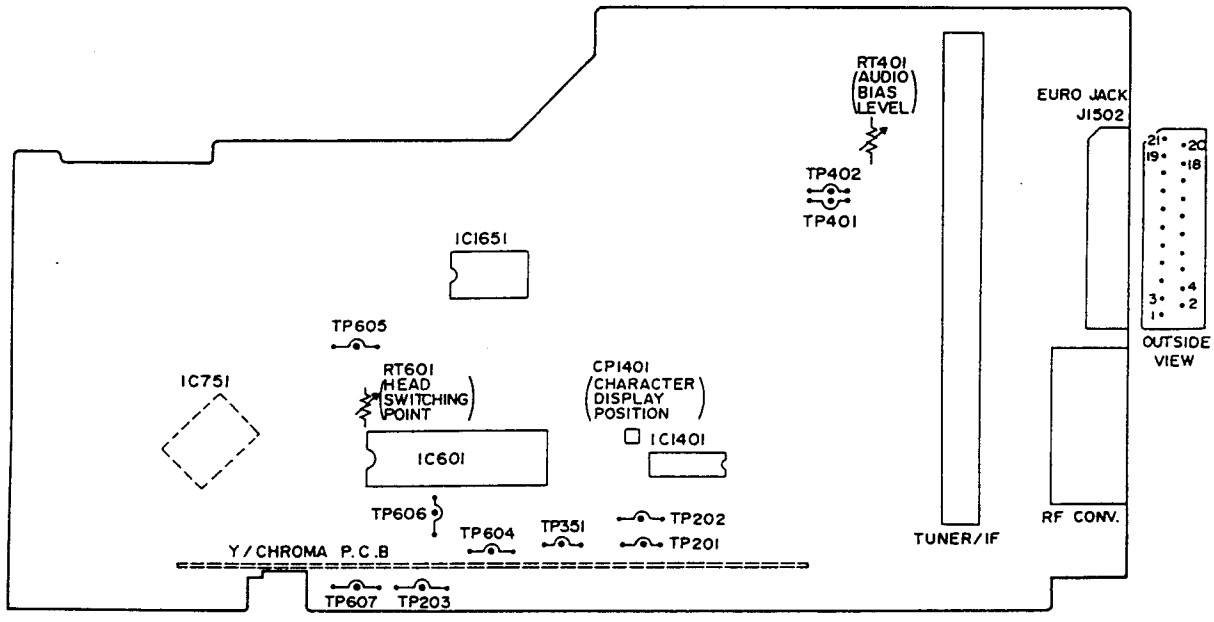


Fig. 1-3 Main Circuit Board (Solder Side)

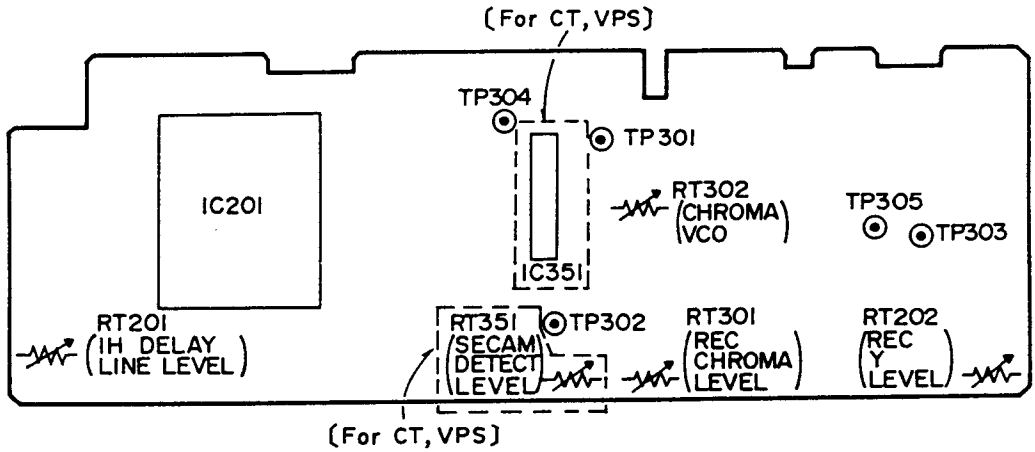


Fig. 1-4 Y/Chroma Circuit Board (Components Side)

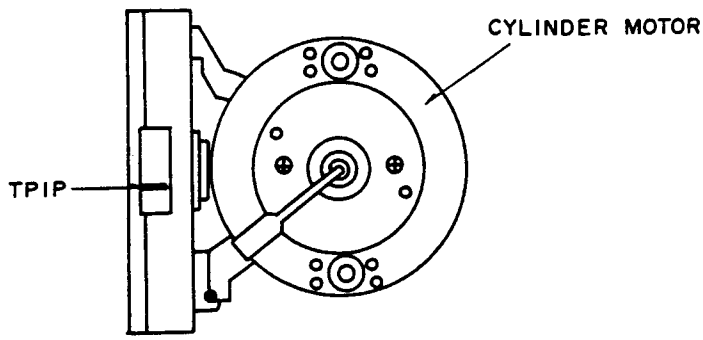


Fig. 1-5 Pre Amp Circuit Board (Top View)

1. SERVO CIRCUIT BOARD ADJUSTMENTS

1. Head Switching Point Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: Set the video head switching point to almost the centre where the CH-1 and CH-2 envelopes overlap each other during playback.

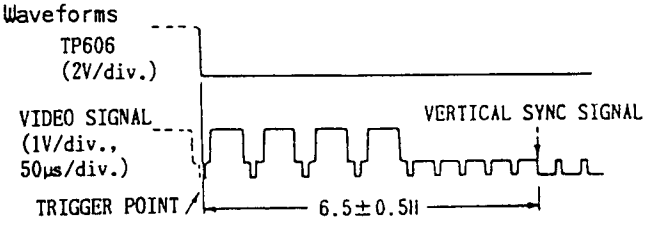
Fault:
- The vertical sync signal is degraded and vertical jitter occurs.
- Switching noise occurs in lower part of picture

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
• Oscilloscope	• CH-1: VIDEO OUT • CH-2: TP606 (SW25Hz)	• Playback alignment tape (Stairsteps Section) • Tracking control: Electrical Centre	• RT601
• Alignment tape (MH-2) (Parts No. 7099052)			

Adjustment Procedure
(Oscilloscope Settings)
- Set sync slope switch to "−"
- Trigger with CH-2

Vertical sync signal :
6.5H±0.5H from trailing edge (trigger point) of SW25Hz pulse.

Waveforms



2. Vert. Sync Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: Change timing for adding vertical drive pulse and suppress vertical jitter in picture during trick play.

Fault: Vertical jitter occurrs during trick play.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
• Monitor TV	• RF OUT	• Record colour bar signal and play it back with this unit in STILL mode.	• TRACKING BUTTONS (▲/▼)
• Colour bar generator (or receive TV programme)	• VIDEO IN		
• Blank tape			

Adjustment Procedure
TRACKING BUTTONS : Suppress vertical jitter in picture.

2. Y/CHROMA CIRCUIT ADJUSTMENTS

1. Rec Y/CHROMA Level Adjustments

Purpose of adjustment and fault occurring if incomplete

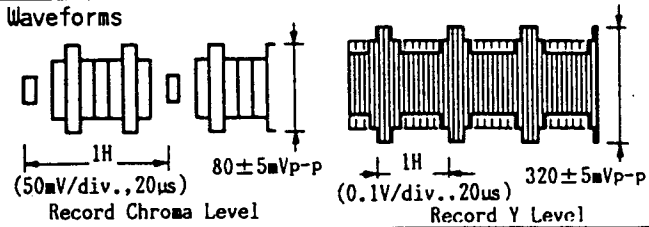
Purpose: Set the Y/C record levels to the optimum valuse.

Fault:
- Diamond beats occur in the played back picture or colouring becomes poor.
- The played back picture becomes dark and noise increases, or the picture glares and becomes whitish.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Points
• Oscilloscope	• TP1 (on PRE AMP) • GND (SHIELD COVER)	• REC mode	• RT301(REC CHROMA LEVEL) • RT202(REC Y LEVEL)
• Colour bar generator (or receive TV programme)	• VIDEO IN		
• Blank tape			

Adjustment Procedure
1) Turn the RT202 fully counterclockwise (copper side)
2) RT301:Set the record chroma level to 80±5mVp-p.
3) RT202:Set the record Y level to 320±5mVp-p.

Waveforms



2. 1H Delay Line Level Adjustment

Purpose of adjustment and fault occurring if incomplete

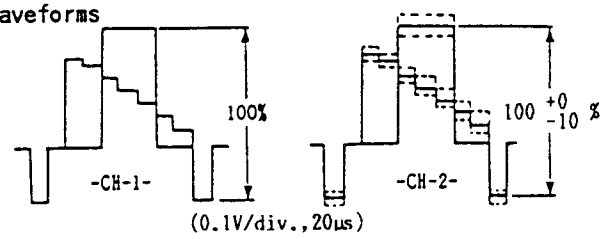
Purpose: To operate the vertical processor normally.

Fault: • Random noise may be comspicuous.
• Dropout may not be compensated.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
• Oscilloscope	• CH-1: TP201(CCD VIDEO) • CH-2: TP202(CCD VIDEO)	• Playback alignment tape (Colour bars section)	• RT201
• Alignment tape(MH-2) (Parts No.7099052)			

Adjustment Procedure
(Oscilloscope setting)
• Trigger with CH-2
RT201:Set the amplitude of CH-2 waveform to 100 $^{+0}_{-10}$ % of that of CH-1 waveform.

Waveforms



3. Secam Detect. Level Adjustments (For CT, VPS)

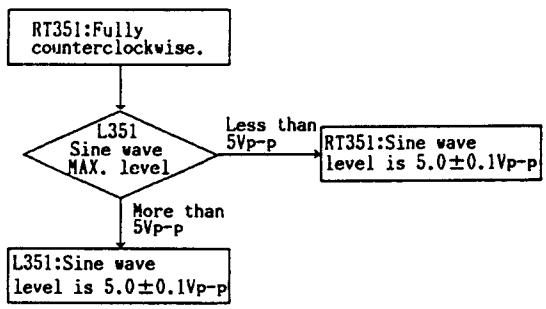
Purpose of adjustment and fault occurring if incomplete

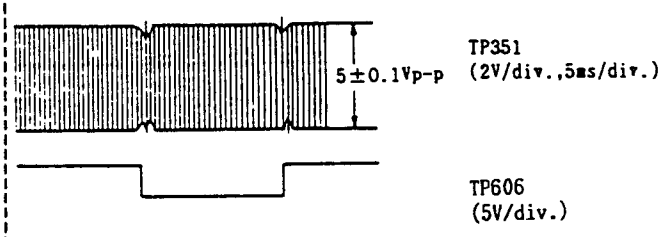
Purpose: Set the Secam detect level to the specified value.

Fault: During automatic discrimination PAL and SECAM are discriminated incorrectly.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Points
• Oscilloscope	• CH-1: TP351 • CH-2: TP606 (SW25Hz)	• REC mode	• RT351 • L351
• SECAM colour bar generator (Full colour bar)	• VIDEO IN		
• Blank tape			

Adjustment Procedure
(Oscilloscope Settings)
• Trigger with CH-2





4. Chroma VCO Adjustment

Purpose of adjustment and fault occurring if incomplete

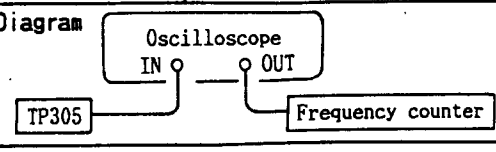
Purpose: Fine tune the 627kHz VCO oscillation frequency.

Fault: Colour becomes poor during playback.

Test Equipment/Jig	Test Equipment Connection Point	VTR State	Adjustment Point
• Oscilloscope	• TP305	• LINE mode (Non-signal)	• RT302
• Frequency counter	• Oscilloscope output		

Adjustment Procedure
1) Connect a jumper between TP301 and TP303.
2) Connect the jumper between TP301 and TP606.
3) RT302: The frequency counter reads 627kHz±5kHz.

Connection Diagram



3. AUDIO CIRCUIT ADJUSTMENT

1. Audio Bias Level Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: Set audio bias during recording to optimum level.

Fault: • Bias too high: High-frequency response deteriorates.
• Bias too Low: Sound tends to be distorted.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
• VTVM	• TP401(BIAS) • TP402(BIAS GND)	• Non-signal recording	• RT401
• Blank tape			

Adjustment Procedure

RT401: The VTVM reads 2.5mVrms±0.1mVrms.

4. ON SCREEN DISPLAY CIRCUIT ADJUSTMENT

1. Character Position Adjustment

Purpose of adjustment and fault occurring if incomplete

Purpose: To set the positions of characters displayed on the screen.

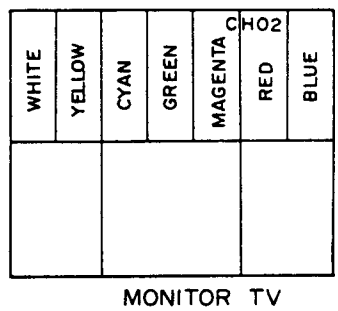
Fault: The character display position is drifted.

Test Equipment/Jigs	Test Equipment Connection Points	VTR State	Adjustment Point
• Colour bar generator	• VIDEO IN jack	• Receive colour bar signal (LINE IN) • OSD mode	• CP1401
• Monitor TV	• Check with monitor TV		

Adjustment Procedure

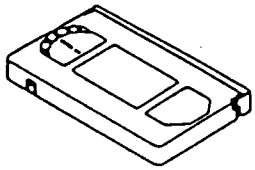
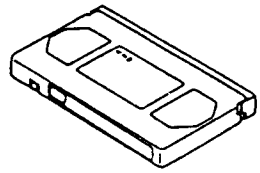
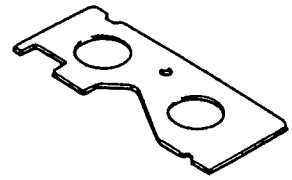
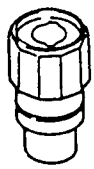
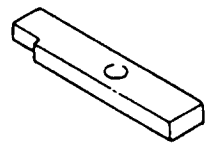
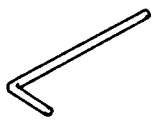
1) Operate the remote control to display the channel number.
2) CP1401: Set the end of letter "H" of the channel display to the border between magenta and red.

Adjustment Diagram

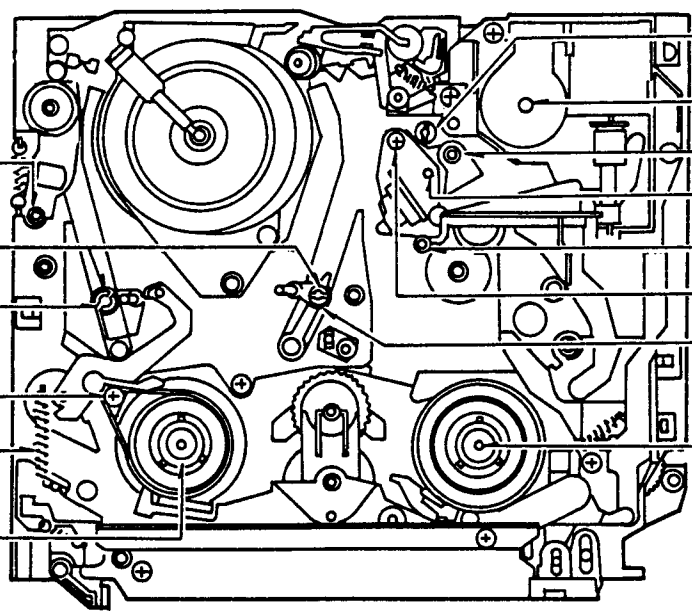


MECHANISM ADJUSTMENT

JIGS AND TAPES FOR ADJUSTMENT

1. Back Tension Meter Parts No.7099004 	2. Alignment Tape - MH-2 - Parts No. 7099052 	3. Master Plane Parts No.7099279 
4. Torque Gauge Parts No.7099039 	5. Torque Gauge Adaptor Parts No.7099035 	6. Reel Disk Height Jig Parts No.7099038 
7. 1.5㎜ Hexagonal Wrench 0.9㎜ Hexagonal Wrench 		

ADJUSTMENT PARTS LOCATIONS


SUPPLY GUIDE POLE HEIGHT ADJUSTMENT NUT
GUIDE ROLLER RETAINING HEXAGONAL SCREWS
SUPPLY GUIDE ROLLER HEIGHT ADJUSTMENT SCREW
TENSION POSITION ADJUSTMENT
TENSION ADJUSTMENT SPRING
SUPPLY REEL DISK HEIGHT ADJUSTMENT
X-VALUE ADJUSTMENT SCREW
MECHANISM STATE SWITCH
A/C HEAD HEIGHT ADJUSTMENT NUT
A/C HEAD TILT ADJUSTMENT SCREW
TAKE-UP GUIDE POLE HEIGHT ADJUSTMENT NUT
A/C HEAD AZIMUTH ADJUSTMENT SCREW
TAKE-UP GUIDE ROLLER HEIGHT ADJUSTMENT SCREW
TAKE-UP REEL DISK HEIGHT ADJUSTMENT

Top View of Mechanism

MECHANICAL PARTS ADJUSTMENT

1. Mechanism State Switch

Purpose: To detect the mechanism state correctly and prevent malfunctions.

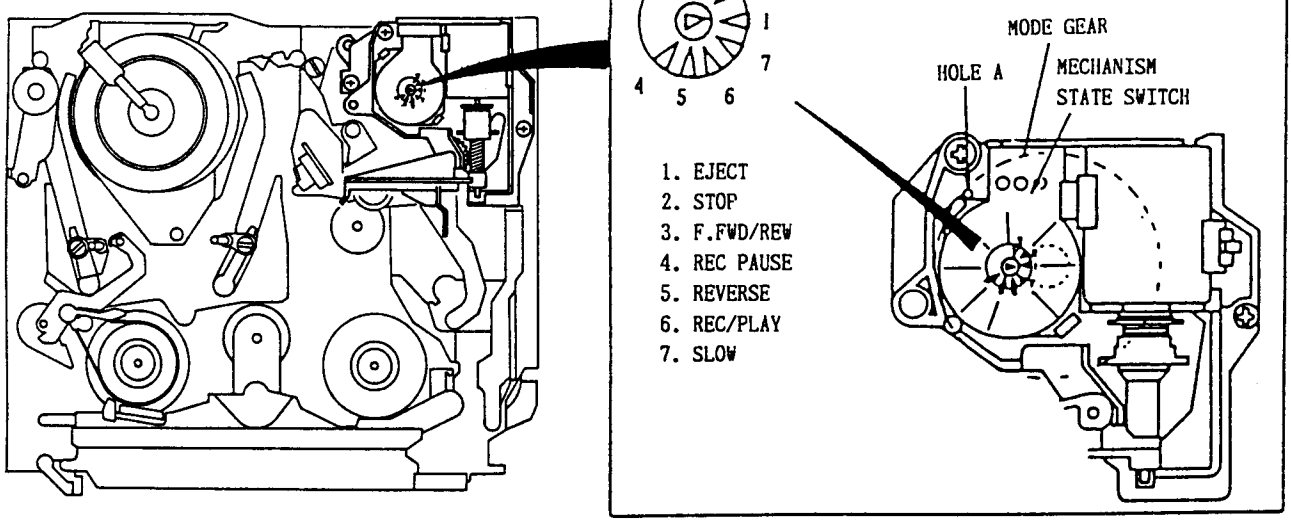
Test equipment/jig	Preparation for adjustment	State of VTR	Adjustment points
· Blank tape	———	· Eject mode (with the cassette ejected)	· Mechanism state switch · Mode gear

Adjustment procedure

1) Check that the arrow on the centre shaft of the mechanism state switch points to the arrow of mechanism mode indication number 1. Also check that hole (A) beside the mechanism state switch and the hole in the mode gear are aligned.

2) If the above alignments are not obtained, adjust as follows.
   1. Remove the mechanism state switch/loading motor assembly.
      (See "MAIN MECHANICAL COMPONENTS REMOVAL" in CHAPTER 2.)
   2. Move the mode gear to align the position of hole (A).
   3. Turn the gear on the back of the mechanism state switch so that the arrow on the centre shaft of the switch points to the arrow of mechanism mode indication number 1.
   4. Reinstall the mechanism state switch/loading motor assembly in the above condition.

3) Load a blank tape and perform various operations to check that loading and unloading are performed correctly.



TAPE TRANSPORT SYSTEM PARTS ADJUSTMENT

The tape transport system is the path from the supply reel disk passing through the video heads to the take-up reel disk. The transport system parts, especially the parts which directly come into contact with a tape, should be kept clean without scratches, dust, oil, etc.

The tape transport system has been adjusted before the unit is shipped from the factory. Therefore, when parts in the transport system are replaced, the transport system is stabilized by only adjusting the new parts correctly.

1. Reel Disk Height Adjustment

Purpose: To set the reels of the cassette to the specified height, thus determining the height of tape.

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
· Master plane (Parts No.7099279) · Reel disk height jig (Parts No.7099038)	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	· Spacers in the supply and take-up reel disks

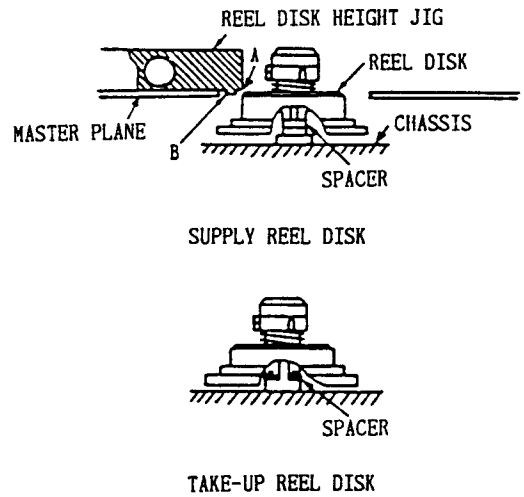
Adjustment procedure

1) Check that the reel disk is between sections A and B of the reel disk height jig.
2) If the disk is not between sections A and B of the jig, replace the spacer (0.5mm thick) in the reel disk or adjust them.

(Caution)

When the tension arm and tension band are removed, adjust the tension pole position and tension after reinstalling them.

Adjustment diagram



2. Tension Pole Position and Tension Adjustment

Purpose: To make the tension of tape constant so that the contact between the video heads and tape is stabilized.

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
Position adjustment ———	———	1) Remove the top cover. 2) Set the VTR to the loading state without inserting a cassette. (See page 4-11)	Position adjustment: Tension band holder
Tension adjustment ・Back Tension Meter (Parts No.7099004)	———	Tension adjustment 3) Play the tension cassette.	Tension adjustment: Tension spring hooking position

Adjustment procedure

- Position Adjustment -

1) Loosen the tension band retaining screw.
2) Insert the tension band holder into one of grooves 1 to 3 and set the gap between the tension pole and chassis to -0.5 to 2mm.
3) Tighten the tension band retaining screw.
4) After adjustment is completed, perform loading without inserting a cassette and recheck the tension pole position.

- Tension Adjustment -

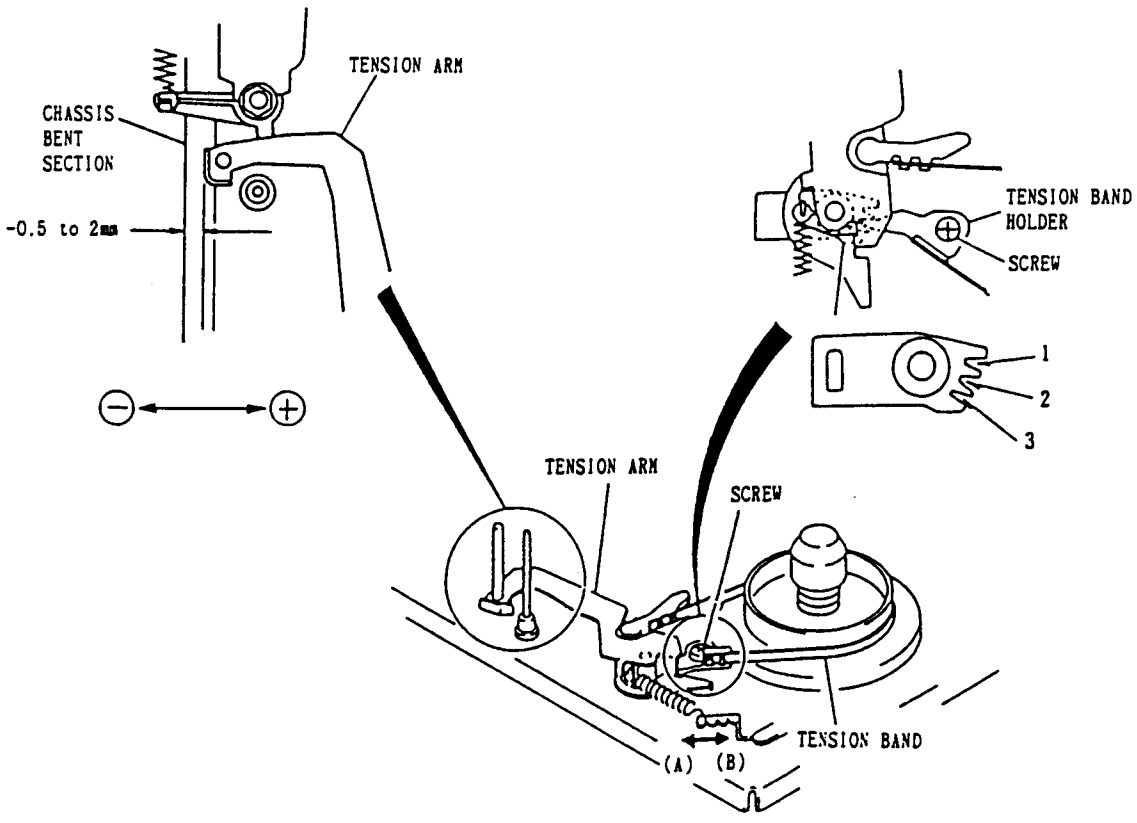
Reading of Back Tension Meter: 34 to 44 g-cm (reference value)

If the reading is higher than the reference, move the spring in direction (A)

If the reading is lower than the reference, move the spring in direction (B).

Caution: When the tension position was changed greatly (more than 6 g-cm), recheck the tension pole position. If it is drifted, readjust the tension pole position and tension.

Adjustment diagram



3. Guide Pole Height Adjustment

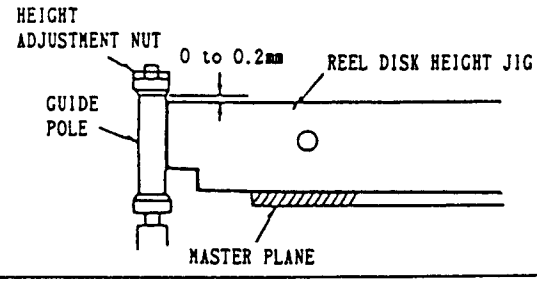
Purpose: To regulate the tape height.

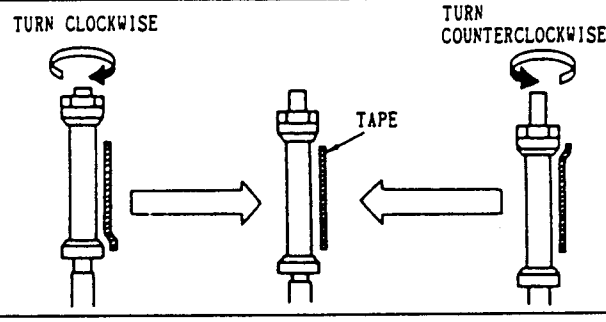
Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
• Master plane (Parts No.7099279) • Reel disk height jig (Parts No.7099038)	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	• Nuts on the supply and take-up guide poles
• Blank tape	——	• Playback mode	

Adjustment procedure

1) Set the clearance between the bottom of the guide pole's upper flange and top of the reel disk height jig is 0 to 0.2mm.
2) Load a blank tape to run it and check that the tape does not ride over the upper and lower flanges of the guide pole.
3) If the tape rides over either flange, adjust the height of guide pole as follows.
   If the tape rides over the upper flange, turn the nut counterclockwise.
   If the tape rides over the lower flange, turn the nut clockwise.

Adjustment diagram





4. Guide Roller Height Adjustment

Purpose: To regulate the height of tape so that the bottom of tape runs along the tape guide line on the cylinder.

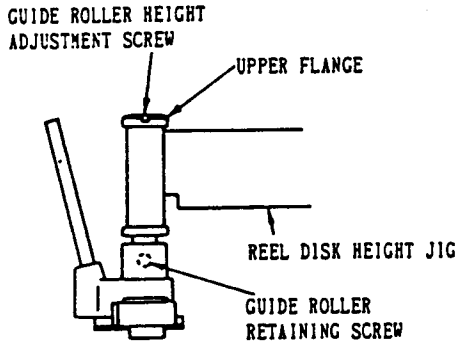
Coarse Adjustment

Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
• Master plane (Parts No.7099279) • Reel disk height jig (Parts No.7099038) • 0.9mm Hexagonal wrench	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	Height adjustment screws on the supply and take-up guide rollers

Adjustment procedure

1) Loosen the guide roller retaining screw (so that the guide roller does not turn during loading, unloading and play).
2) Align the bottom of the guide roller's upper flange and the top of the reel disk height jig.
3) Perform the precise adjustment continuously.

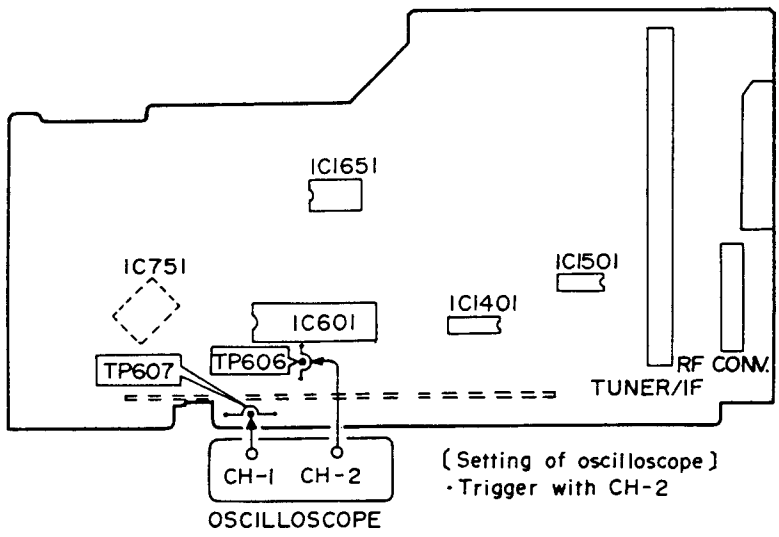
Adjustment diagram



Precise Adjustment

Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment points
· Oscilloscope	· CH-1: TP607 (PB FM) · CH-2: TP606 (SW25Hz)	· Play alignment tape. (Colour bars)	· Guide roller height adjustment screws
· Alignment tape (MH-2) (Parts No.7099052) · 0.9mm Hexagonal wrench	——		

Connection diagram

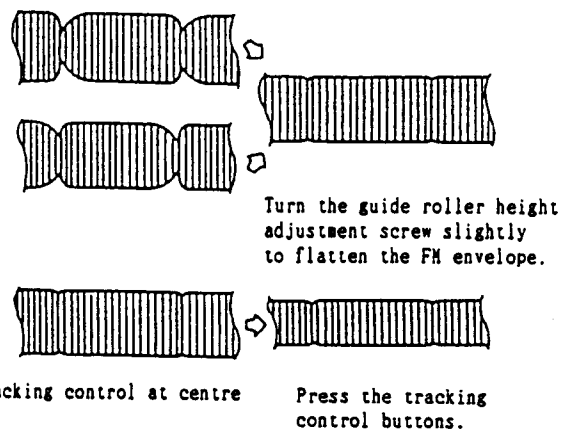


Adjustment procedure

Note: To set tracking to the electrical centre
· Press the EJECT button to remove the alignment tape and re-insert it.

1) Tracking control (playback) : Electrical centre position
(when this adjustment is performed after the cylinder has been replaced, set the tracking control so that the FM output is maximum.)
2) Height adjustment screw: Flatten the FM envelope.
3) Press the tracking control up and down buttons.
4) Check that the FM drops at the start and end of FM envelope are uniform.
5) Tighten the guide roller retaining screw.

Waveforms


Turn the guide roller height adjustment screw slightly to flatten the FM envelope.
Tracking control at centre
Press the tracking control buttons.

5. Audio / Control (A/C) Head Adjustment

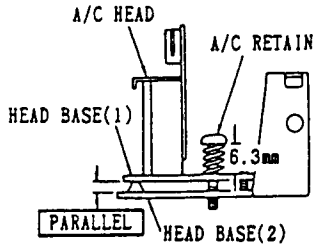
Purpose: To keep the contact between the tape and head even so the specified track is recorded and played back.

Coarse Adjustment

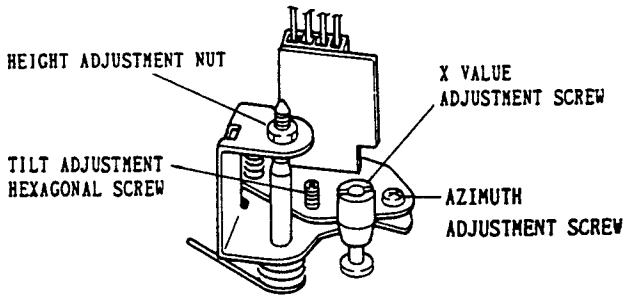
Test equipment/jigs	Preparation for adjustment	State of VTR	Adjustment points
• Master plane (Parts No.7099279) • Reel disk height jig (Parts No.7099038) • 1.5mm Hexagonal wrench	1) Remove the cassette loading mechanism. 2) Mount the master plane and place the reel disk height jig on it.	——	• A/C head retaining screw • Azimuth adjustment screw • Height adjustment nut • Tilt adjustment screw
• Blank tape	——	• Run the blank tape.	

Adjustment procedure/adjustment diagrams

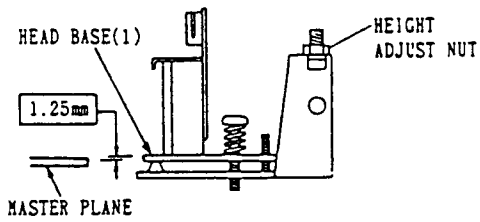
1) A/C head retaining screw: Check that the spring section of the A/C head retaining screw protrudes 6.3mm over the top of head base (1).



2) Tilt adjustment hexagonal screw, azimuth adjustment screw: Make head bases (1) and (2) parallel.

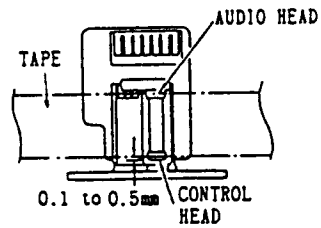


3) Height adjustment nut: Set the clearance between the master plane and head base (1) to approx. 1.25mm.



4) Remove the adjustment jigs, load a blank tape and set the VTR to the play mode.

5) Check that there is no conspicuous curling and riding over around the A/C head. If there is conspicuous curling or riding over, readjust the tilt adjustment hexagonal screw, azimuth adjustment screw and height adjustment nut. When the bottom edge of tape is 0.1 to 0.15mm from the bottom edge of the control head's core, the height of A/C head is ideal.



6) Perform the precise adjustment continuosly.

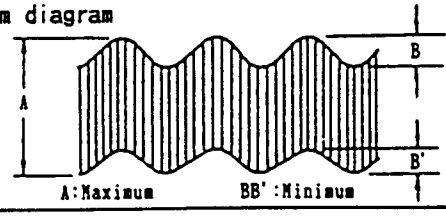
Precise Adjustment

Test equipment/jigs	Test equipment connection point	State of VTR	Adjustment points
• Oscilloscope	• AUDIO OUT jack	• Play alignment tape (Stairsteps)	• Azimuth adjustment screw • Height adjustment nut • Tilt adjustment screw
• Alignment tape (MH-2) (Parts No.7099052) • 1.5mm Hexagonal wrench	——		

Adjustment procedure

1) Adjust the azimuth adjustment screw, height adjustment nut and tilt adjustment hexagonal screw slightly and alternately: Make the audio output maximum and flat (minimum fluctuations).

Waveform diagram



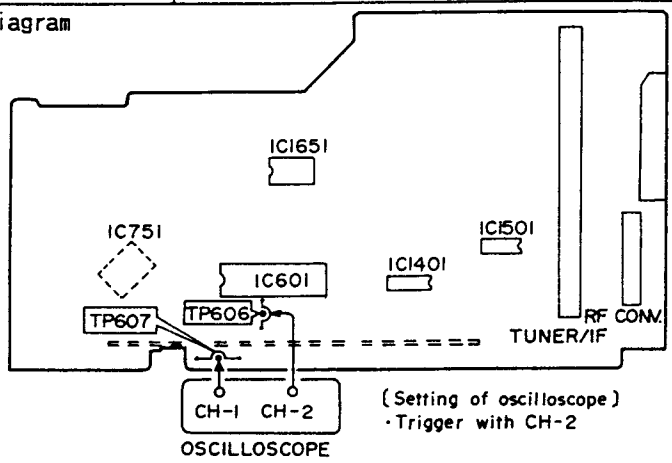
6. X Value Adjustment

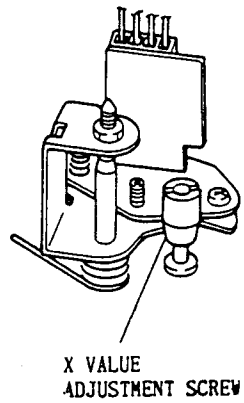
Purpose: To obtain compatibility with other VTRs.

Note: Always perform the tracking preset adjustment (page 3-3) that should be done when the cylinder is replaced before adjusting the X value.

Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment point
• Oscilloscope	• CH-1: TP607 (PB FM) • CH-2: TP606 (SW25Hz)	• Play alignment tape (Stairsteps)	• X value adjustment screw
• Alignment tape (MH-2) (Parts No.7099052) • 1.5mm Hexagonal wrench	—		

Connection diagram

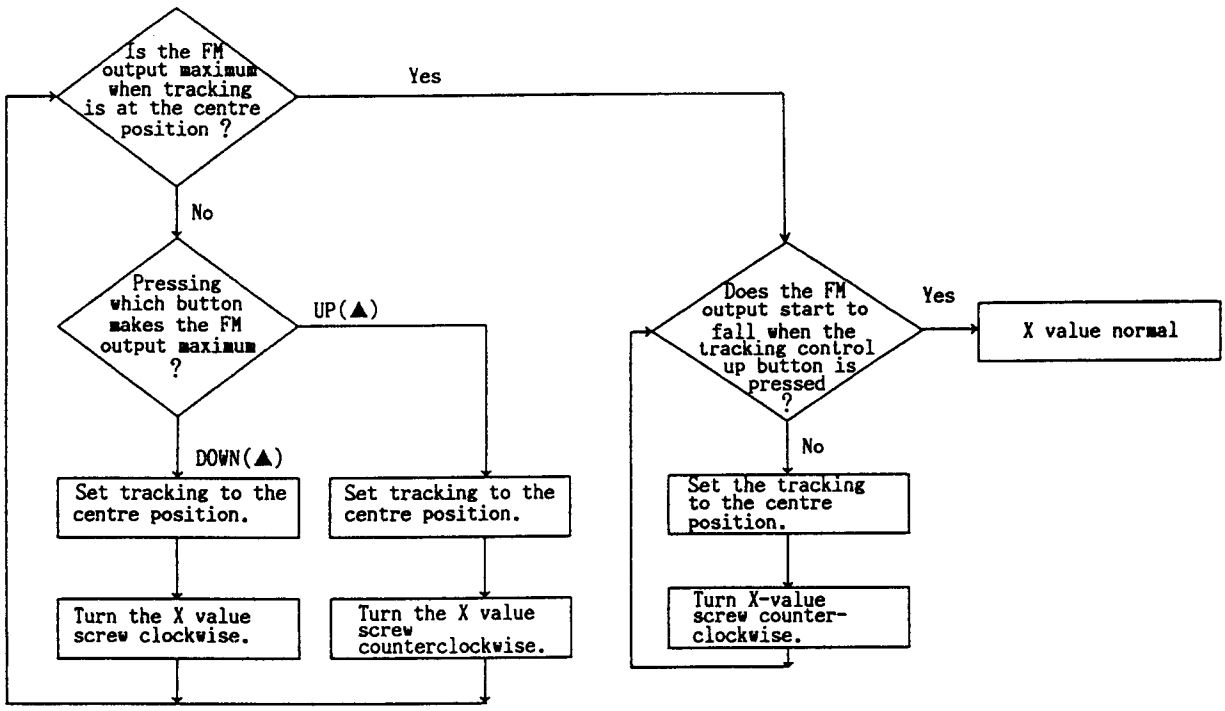




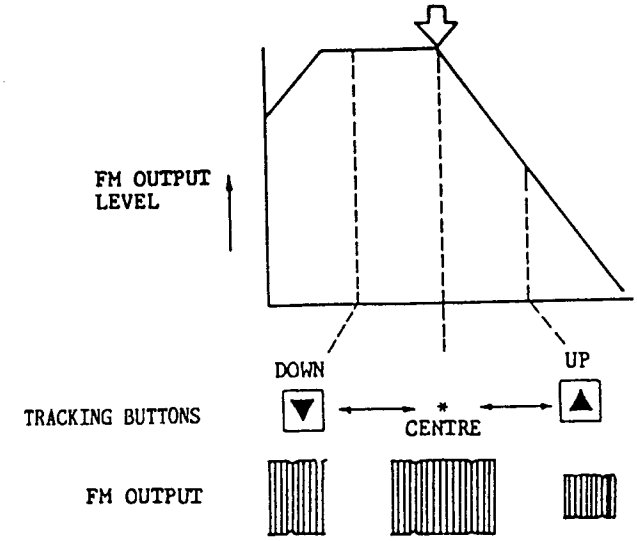
Adjustment procedure

Adjust so that the FM output is maximum when tracking is set to the centre and it starts to fall when the tracking up button is pressed.

Note: To set tracking to the centre
- Press the EJECT button to remove the alignment tape and re-insert it.


Is the FM output maximum when tracking is at the centre position ?
Yes
No
Pressing which button makes the FM output maximum ?
UP(▲)
DOWN(▲)
Set tracking to the centre position.
Set tracking to the centre position.
Turn the X value screw clockwise.
Turn the X value screw counterclockwise.
Does the FM output start to fall when the tracking control up button is pressed ?
Yes
X value normal
No
Set the tracking to the centre position.
Turn X-value screw counter-clockwise.

Adjustment diagram

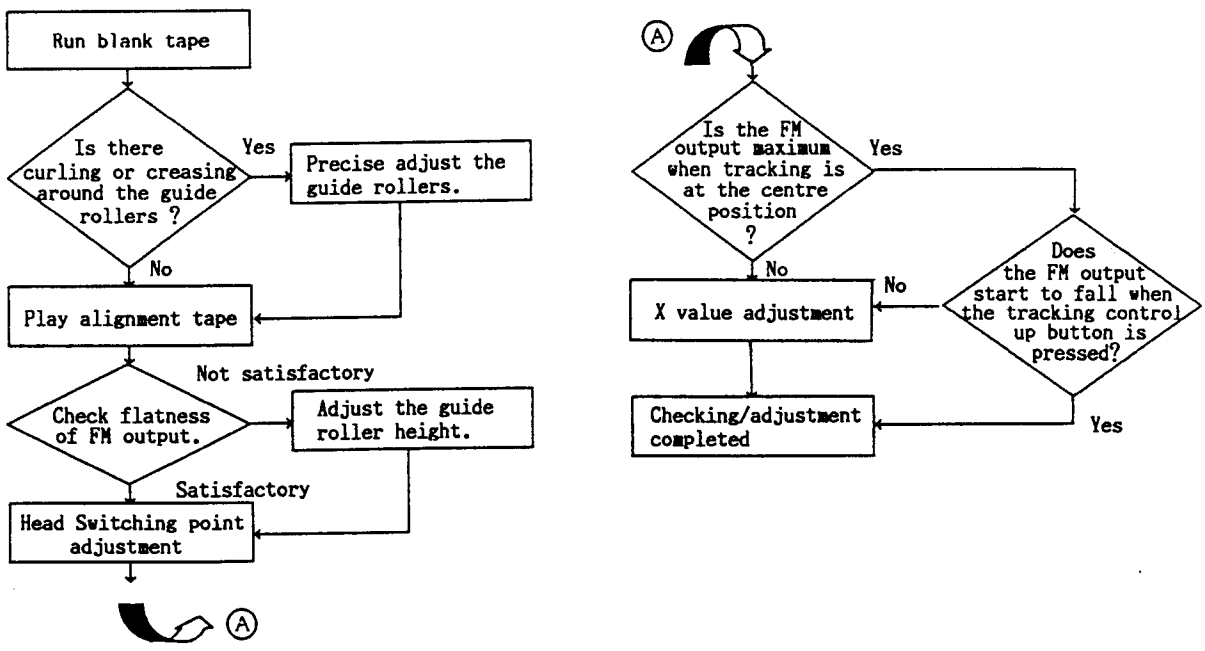


7. Adjustments After Replacing Cylinder (Video Heads)

Purpose: To suppress drift in the height relative to the guide roller and to minimize the X value after replacing the cylinder.

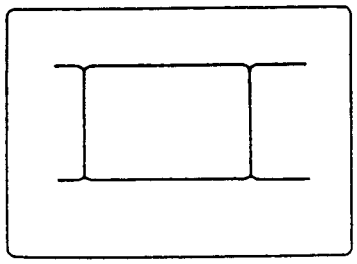
Test equipment/jigs	Test equipment connection points	State of VTR	Adjustment points
• Oscilloscope	Checking the flatness • CH-1: TP607 (PB FM) • CH-2: TP606 (SW25Hz)	• Run the blank tape	• Guide rollers (precise adjustment on page 4-6) • Head switching point (page 3-3) • X value (page 4-8)
• Alignment tape (MH-2) (Parts No.7099052) • Blank tape • 0.9mm/1.5mm Hexagonal wrenches • X value adjustment screwdriver	—	• Play alignment tape (Stairsteps)	

Checking/adjustment procedure

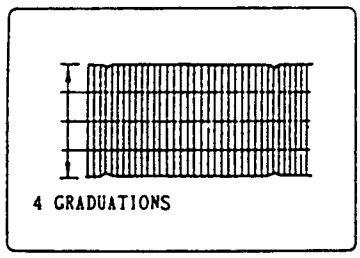


Checking procedure of the flatness and fluctuations of FM output and waveform diagrams

1) Use the tracking control to maximize the FM output.

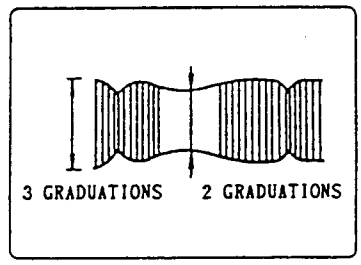


2) Fine tune the voltage level range of the oscilloscope to set the FM output to 4 graduations.



3) Press the tracking control buttons to set the maximum amplitude of the FM output 3 graduations.

4) Check that the mimimum amplitude is more than 2 graduations.



5) Check that the level fluctuations between the maximum and minimum amplitudes are less than 13%.

8. Tension/Torque Checks

Purpose: It is necessary to check the tension, torque and compression force at the tape take-up section and moving section to make the tape running smooth and satisfy the basic performance of the VTR. Check these if the tape running is not smooth or the tape speed is abnormal.

Test equipment/jigs	State of VTR
• Torque gauge • Torque gauge adaptor	• Set the VTR to each operation mode without inserting a cassette. (See page 4-11)

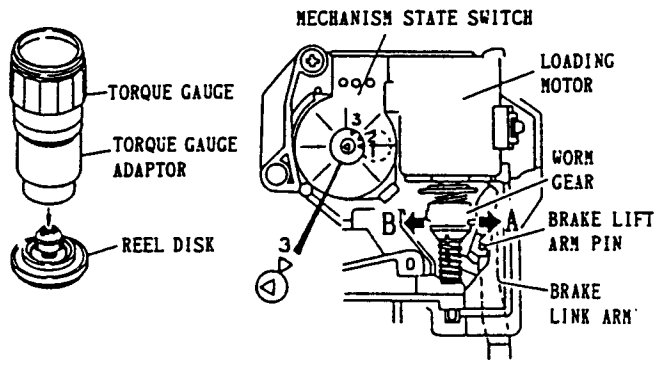
Item	VTR operation mode	Measured reel	Measured value
Main brake torque	Stop (Note)	Supply & take-up reels	170 g·cm or more
Slack removal torque	Unloading	Supply reel	90 ~ 230 g·cm
Fast forward torque	Fast forward	Take-up reel	400 g·cm or more
Rewind torque	Rewind	Supply reel	400 g·cm or more
Take-up torque	Play	Take-up reel	80 ~ 170 g·cm
Back-tension torque	Fast forward	Supply reel	4 ~ 25 g·cm
	Rewind	Take-up reel	

Checking method

The values are measured using a torque gauge and a torque gauge adaptor with the torque gauge fixed.

Note: Turn the worm gear in the direction of arrow (A) in the stop mode and shift the pointer on the mechanism state switch to "3" so as to apply the main brake to the supply reel disk. Then turn the worm gear in the direction of arrow (B) so that brake link arm is released from the brake lift arm pin.(Set the reel drive idler to the centre position.)

Adjustment diagram

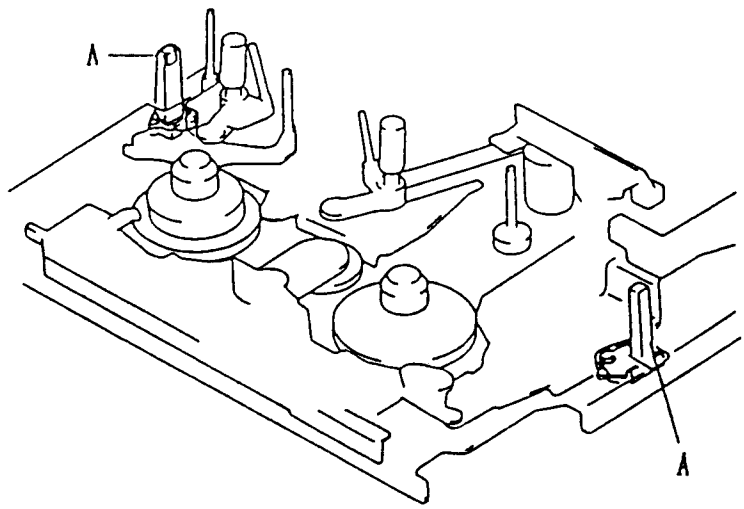


9. To Set the VTR to the Loading State without Inserting a Cassette

1) Remove the top cover and front panel.
2) Remove the cassette loading mechanism.
3) Unplug the power lead form the AC outlet.
4) Cover the supply and take-up end sensors (sections A in the figure below) with black masking tape, etc. to shut off the light.
5) Plug the mains lead into the AC outlet.
6) Turn the VTR on.
   The VTR can accept the inputs of each mode in this state. However, the rewind operation cannot be performed for more than a few seconds because the take-up reel disk in the stop state and reel pulses cannot be detected.

〔Cautions〕
Always return the VTR to the original state in the following order after the above operations have been performed.
1) Remove the masking tape, etc. from the supply and take-up end sensor.
2) Unplug the mains lead from the AC outlet to reset the system control microprocessor.

Adjustment diagram



MAINTENANCE/INSPECTION PROCEDURE

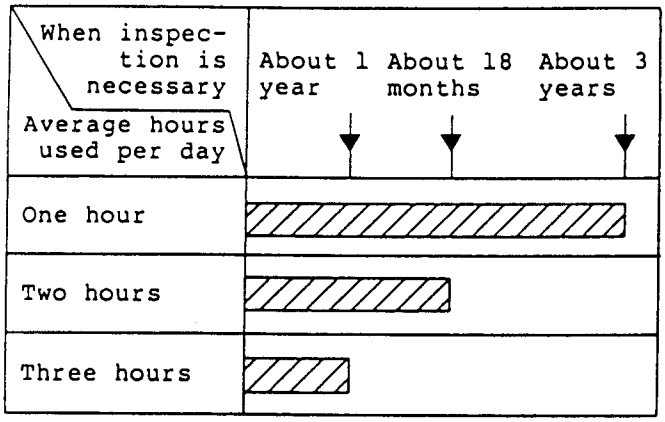
1. Required Maintenance

The recording density of a VTR is much higher than that of an audio tape recorder. VTR components must be very precise, at tolerances of 1/1000 mm, to ensure compatible with other VTRs. If any of these components are worn or dirty, the symptoms will be the same as if the part is defective. To ensure a good picture, periodic inspection and maintenance, including replacement of worn-out parts and lubrication, is necessary.

2. Scheduled Maintenance

Schedules for maintenance and inspection are not fixed because they are greatly according to the way in which the customer uses the VTR, and the environment in which the VTR is used. But, in general home use, a good picture will be maintained if the inspection and maintenance is done every 1,000 hours. The table below shows the relation between time used and inspection period.

Table 1



3. Check before starting Repairs

The following faults can be remedied by cleaning and oiling. Check the need for lubrication and the conditions of cleanliness in the unit. Check with the customer to find out how often the unit is used. If from that you determine that the unit is ready for inspection and maintenance, check the following parts.

Table 2

Phenomenon	Inspection Location
Poor S/N, no colour	Dirt on video head or worn video head
Tape does not run or tape is slack	Dirt on pressure roller, reel belt or flywheel belt
Vertical jitter, horizontal jitter	Dirt on video head or in tape transport system
Colour beats	Dirt on full-erase head
Low volume or sound distorted	Dirt on audio/control head
Fast forward or rewind is not done or rotation is slow	Dirt on reel belt

4. Tools Needed for Inspection and Maintenance

(1) Head cleaning kit
(2) VTR oil kit
(3) Alcohol (or freon)
(4) Gauze
(5) Screwdriver for adjusting X-value

Table 3 Locations for Greasing and Oiling using the Kit

Name	Oil or Greasing Location
Sonic Slidas Oil (#1600)	Oil low-speed rotating sections
Froil (G31SAY)	Lubricate metal or molded sections under light load
Lock paint	Fix adjustment screws

The above oils and greases are in the kit prepared especially for VTR maintenance. Use this kit for lubrication.

5. Maintenance Procedures

5-1 Cleaning

(1) Cleaning video head

First use a cleaning tape. If dirt on head is too stubborn to remove by tape, use the cleaning kit. Moisten the cleaning stick with cleaning fluid at the point indicated. Touch the stick to the head tip and gently turn the head (rotating cylinder) to the right and left.
(Do not move the stick vertically and make sure that only the chamois leather on the stick comes into contact with the head. Otherwise, the head may be damaged.)
Thoroughly dry the head. Then test run a tape. If cleaning fluid remains on the video head, the tape may be damaged when it comes into contact with the head surface.

(2) Cleaning the tape transport system and drive system, etc.

Wipe with gauze moistened with alcohol or freon.

Notes:
1) The tape transport system is the system which comes into contact with the running tape. The drive system consists of those parts which run the tape.
2) Make sure that during cleaning you do not touch the tape transport system with the tip of a screwdriver and that no force is applied to the system that could deform it.

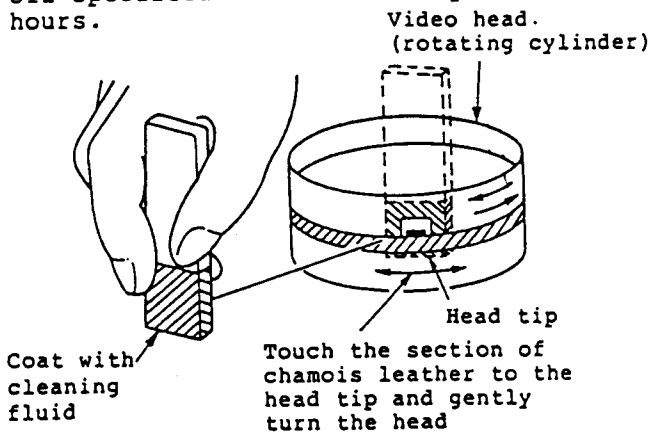
5-2 Lubrication

(1) Guidelines for lubricating with oil

Use the oiler to apply one or two drop of pan motor oil or Sonic Slidas oil. Make sure not to use too much oil because it may spill over or leak out coming into contact with rotating parts and causing slippage or other problems. If too much oil is applied, wipe clean with alcohol or freon.

(2) Periodic oil lubrication

Oil specified locations every 1,000 hours.


Video head.
(rotating cylinder)
Head tip
Coat with cleaning fluid
Touch the section of chamois leather to the head tip and gently turn the head

5-3 Greasing

(1) Greasing guidelines

Apply grease, Hitazol or Froil, with a stick or brush. Do not use excess grease. It may come into contact with the tape transport or drive system. Wipe any excess and clean with gauze moistened with alcohol or freon.

(2) Periodic greasing

Grease specified locations every 5,000 hours.

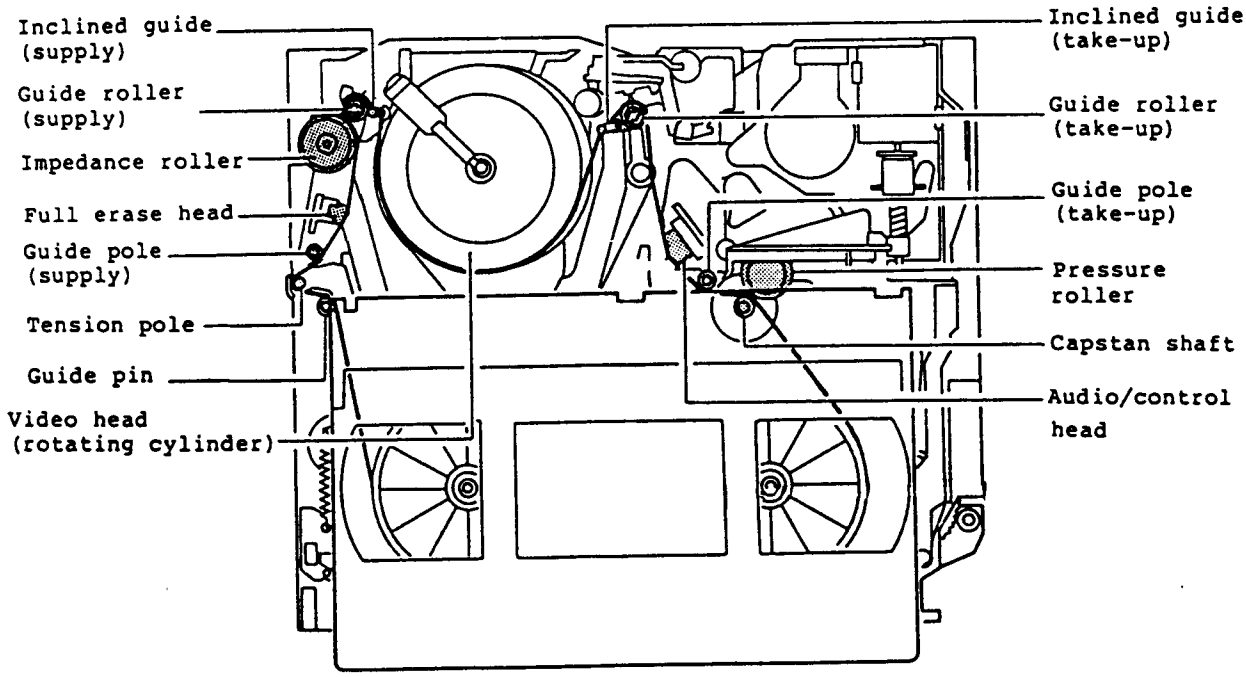


Fig. 1 Tape Transport System

6. Inspection Locations

Phenomenon	Inspection Location	Replacement
Colour beats	Dirt on full erase head	
Poor S/N, no colour	Dirt on video heads	○
Vertical jitter	Dirt on video heads	
	Dirt in tape transport system	
Low volume, sound disordered	Dirt on audio/control head	○
Tape does not run. Tape is slack.	Dirt on pressure roller	○

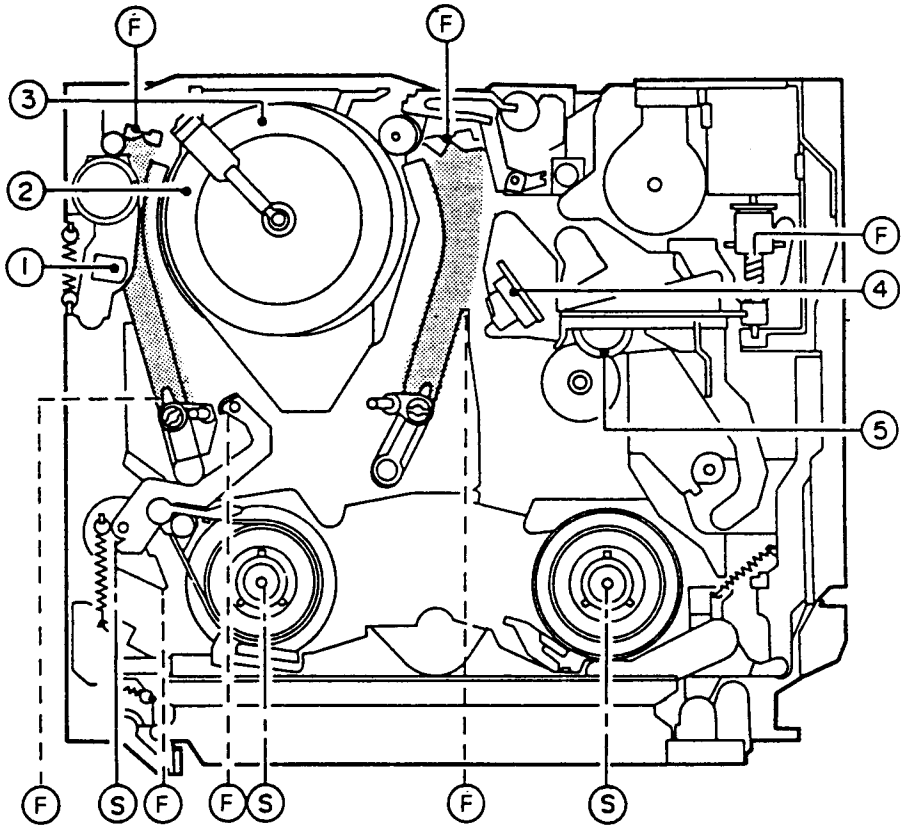


Fig. 2 Top View of Mechanism

Phenomenon	Inspection Location	Replacement
Does not fast fast forward or rewind, or rotation is slow	Dirt on reel belt	○
Tape does not run		
Slack tape		

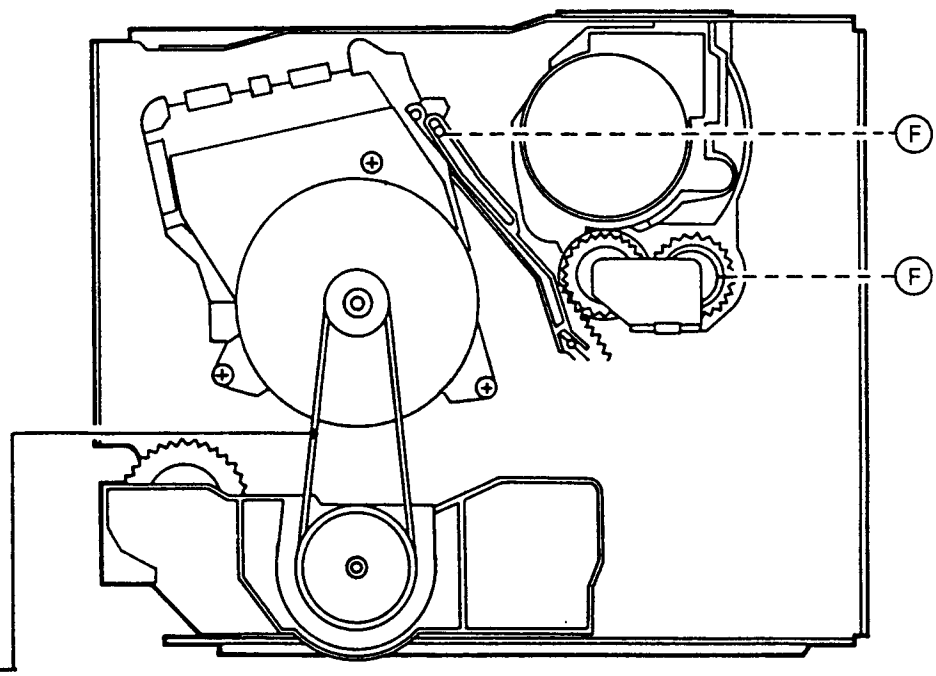


Fig. 3 Bottom View of Mechanism

Note:
If locations marked with "o" do not operate normally after cleaning, they are worn. Replace.
See the EXPLODED VIEWS at the end of this manual as well as the above illustrations for the sections to be lubricated and greased.

Ⓢ : Sonic Slidas oil (#1600)
Ⓕ : Froil (G31SAY)

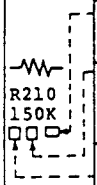
MEMO

SCHEMATIC/CIRCUIT BOARD DIAGRAMS

BEFORE USING THIS SERVICE REFERENCE MATERIAL

How to read abbreviations

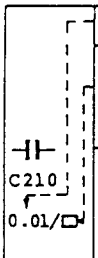
(Resistors)



Value	Not indicated .. Ω(ohm) K ..... kΩ
Tolerance	Not indicated .. ±5% K ..... ±10% M ..... ±20%
Wattage	Not indicated .. 1/8W (All values other than 1/8W are indicated in the schematic diagrams with W omitted)
Sort	Not indicated .. Carbon film RC ..... Carbon solid RW ..... Wire wound RS ..... Metal oxide film RN ..... Metal film

Example:
R120 ..... 150kohm, carbon solid
RC1/2K 1/2W, ±10%

(Capacitors)



Value	Not indicated .. μF P ..... PF
Dielectric strength	Not indicated .. 50WV (All values other than 50WV and electrolytic capacitors are indicated in the schematic diagrams with WV omitted)
Tolerance	Not indicated .. ±10% J ..... ±5% M ..... ±20% C ..... ±0.25PF Z ..... +80% -20% (No tolerance is indicated for electrolytic capacitors (excluding tantalum and high stability electrolytic capacitors))
Sort	Not indicated .. Ceramic General electrolytic (distinguished from ceramic with circuit symbol) MYL ..... Mylar (polyester film) STY ..... Styrol TA ..... Tantalum KU ..... High stability electrolytic MP ..... Metalized paper

Example:
C210
0.01/25 ... Mylar, 0.01μF, 25WV, ±5%
MYL J

Notes:

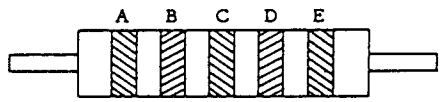
1. Voltages are measured with the negative ⊖ terminal of the power supply as reference in the normal operating mode. The voltages in different modes are indicated in the schematic diagrams; those in parentheses ( ) are in the record mode and those without parentheses are in the play mode.
2. The value, dielectric strength (wattage), tolerance and sort of resistors (excluding variable resistors, etc.) and capacitors are indicated in the schematic diagrams by abbreviations. Replace them correctly, comparing the abbreviations in the schematic diagrams and the table "how to read abbreviations".

Cautions on use of MOS IC

1. The MOS IC is inserted in black foam for shipment. This foam is a conductor which short-circuits between the leads to prevent damage. Do not remove ICs from this foam during their storage. Avoid removing ICs from this foam, placing them on plastic which is likely to be charged with static electricity or inserting them into styrol foam.
2. High voltages may be applied during soldering caused by leakages from the soldering iron, so be sure to ground the tip of the soldering iron or use a low voltage soldering iron.
3. The human body, clothes made of synthetic fibres or nylon gloves may be charged with several thousands volts of static electricity because of friction, so a worker should be earthed.
4. Be sure to earth measuring instruments such as oscilloscopes, VTVMs, etc. used for repairs.

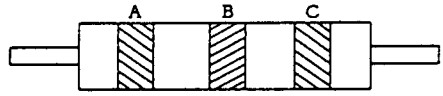
How to read capacity and inductance of resistor shape capacitors and coils

CAPACITOR



CAPACITY: (10A+B) x C (PF)
TOLERANCE: D
RATED VOLTAGE: BODY COLOUR
PINK: 25V
GREEN: 50V
CHARACTERISTICS: E

COIL



INDUCTANCE: (10A+B) x C (μH)

COLOUR	A,B	C	D	E
Black	0	10^0	±20%	For temperature compensation
Brown	1	10^1		
Red	2	10^2		
Orange	3	10^3		
Yellow	4	10^4		
Green	5	10^5		
Blue	6			
Violet	7			
Grey	8		±30%	High dielectric constant type
White	9			For temperature compensation
Gold		10^{-1}	±5%	
Silver		10^{-2}	±10%	High dielectric constant type

SERVICE MANUAL ABBREVIATION LIST

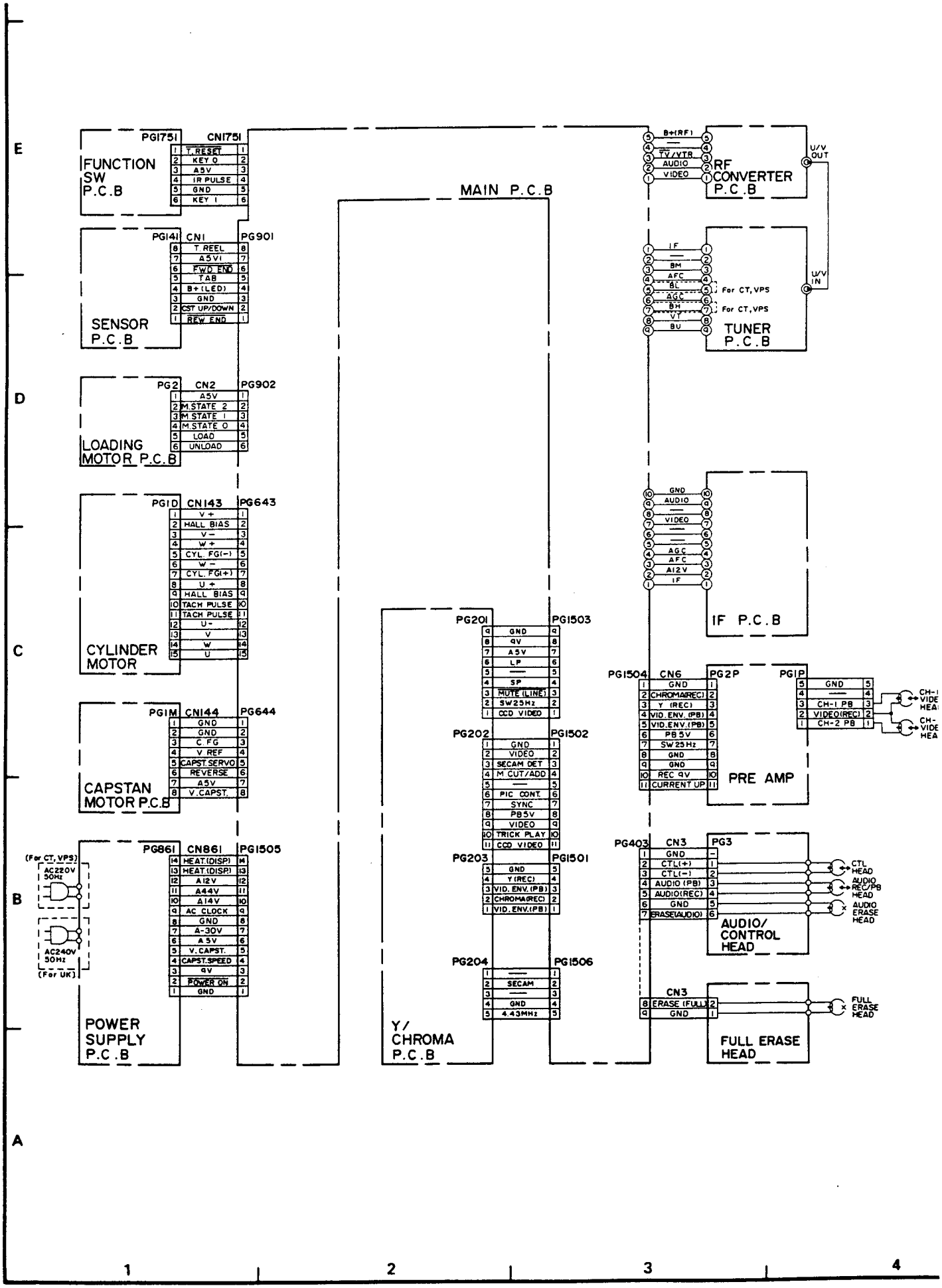
A	
A.DUBB	Audio Dub
ACC	Automatic Colour Control
ACK	Automatic Colour Killer
ADD	Adder
AFC	Automatic Frequency Control
AGC	Automatic Gain Control
ALC	Automatic Level Cotnrol
ASBL	Assemble (Phase Matching)
APC	Automatic Phase Control
AUX	Auxiliary
B	
BATT.	Battery
BG	Burst Gate
BGP	Burst Gate Pulse
BH	Power Supply for Selecting VHF High Band
BL	Power Supply for Selecting VHF Low Band
BPF	Band-pass Filter
BS	Power Supply for Selecting VHF Super Band
BU	Power Supply for Selecting UHF Band
BUF.	Buffer Amplifier
C	
C	Chroma
C.FG/CFG	Capstan Frequency Generator
C.MEMORY	Counter Memory
C.PAUSE	Camera Pause
C.RESET	Counter Reset
C.REVERSE	Count Reverse
C.SYNC	Composite Synchronizing Signal
C/R	Capacitor/Resistor
CATV	Cable TV
CAPST.	Capstan
CCD	Charge Coupled Device
CH	Channel
CHAR:	Character
COM.	Common
COMP-EXP	Compressor-Expander
COMP.	Comparator
COMPE	Compensator
COMP.	Composite
COUNT.	Counter
CST	Cassette
CTL	Control Track Pulse
CYL.	Cylinder
D	
D/A	Digital to Analog
DEEMPH.	Deemphasis
DEMOD.	Demodulator
DET	Detector
DISP.	Display
DL	Delay Line
DN	Down
DO	Dropout
DOC	Dropout Compensator
E	
E-E	Electronic-to-Electronic
EA-ROM	Electrically Alterable Read Only Memory
EMPH	Emphasis
EQ	Equalizer
EXT.	External
F	
FF	Flip Flop
F.FWD	Fast Forward
FG	Frequency Generator
FM	Frequency Modulation
FRAME ADV./F.ADV	Frame Advance
fsc	Sub Carrier Frequency
FWD	Forward
G	
GEN	Generator
GND	Ground
H	
HD	Horizontal Drive
Hi-Fi	High Fidelity
HPF	High-pass Filter
HPL	High-pass Limiter
HSS	Horizontal Sync. Separator
I	
I/O	In/Out
IF	Intermediate Frequency
INDI.	Indicator
INT.	Internal
INV.	Inverter
IR	Infrared Rays
IRT	Instant Recording Timer
L	
LCD	Liquid Crystal Display
LIN.	Linear
LM	Loading Motor
LOG.	Logarithm
LPF	Low-pass Filter
L/R	Left/Right
LP	Long Play
M	
M.CUT	Monitor Cut
M.STATE	Mechanism State
M.STOP	Memory Stop
MEM.	Memory
MIX	Mixer
MM	Monostable Multivibrator
MOD.	Modulator
MPX	Multiplex
N	
NF	Negative Feed Back
NORM.	Normal
NR	Noise Reduction

O	
OSC	Oscillator
OSD	On-Screen Display
P	
PB/PLAY	Playback
PIF	Picture Intermediate Frequency
PLL	Phase Locked Loop
POS.	Positive
POWER CONT.	Power Control
PROG.	Programme
PROTECT.	Protector
PWM	Pulse Width Modulation
R	
REC	Record
RECT.	Rectifier
REF	Reference
REG	Regulator
REV	Reverse
REW	Rewind
RF	Radio Frequency
RAM	Random Access Memory
ROM	Read Only Memory
S	
S/H	Sample and Hold
S.REEL	Supply Reel Sensor
S.TRACK.	Slow Tracking
S-VHS	Super VHS
SAW	Sawtooth
SEP.	Separator
SIF	Sound Intermediate Frequency
SP	Standard Play
SRCH	Search
SRV	Servo
SW 25Hz	Head Switching Pulse
SYNC	Synchronizing Signal
SYS.CON	System Control
T	
T/L	Tuner/Line
T.BRAKE	Take-up Brake
TμP	Timer Microprocessor
T.REEL	Take-up Reel Sensor
T.RESET	Timer Reset
TP	Test Point
TRS	Transfer
TU-μP	Tuning Microprocessor
U	
U/D	Up/Down
UNI.	Unified
V	
V-REF	Voltage Reference
V.DRV	Vertical Drive Pulse
V.DUB	Video Dub
VCO	Voltage Controlled Oscillator
VHS	Video Home Systems
Vss	Voltage Super Source
VOL.	Volume
VSS	Vertical Sync. Separator
VT	Tuning Voltage
VT-U	Tuning Voltage-UHF
VT-V	Tuning Voltage-VHF
Y	
Y/C	Luminance/Chrominance

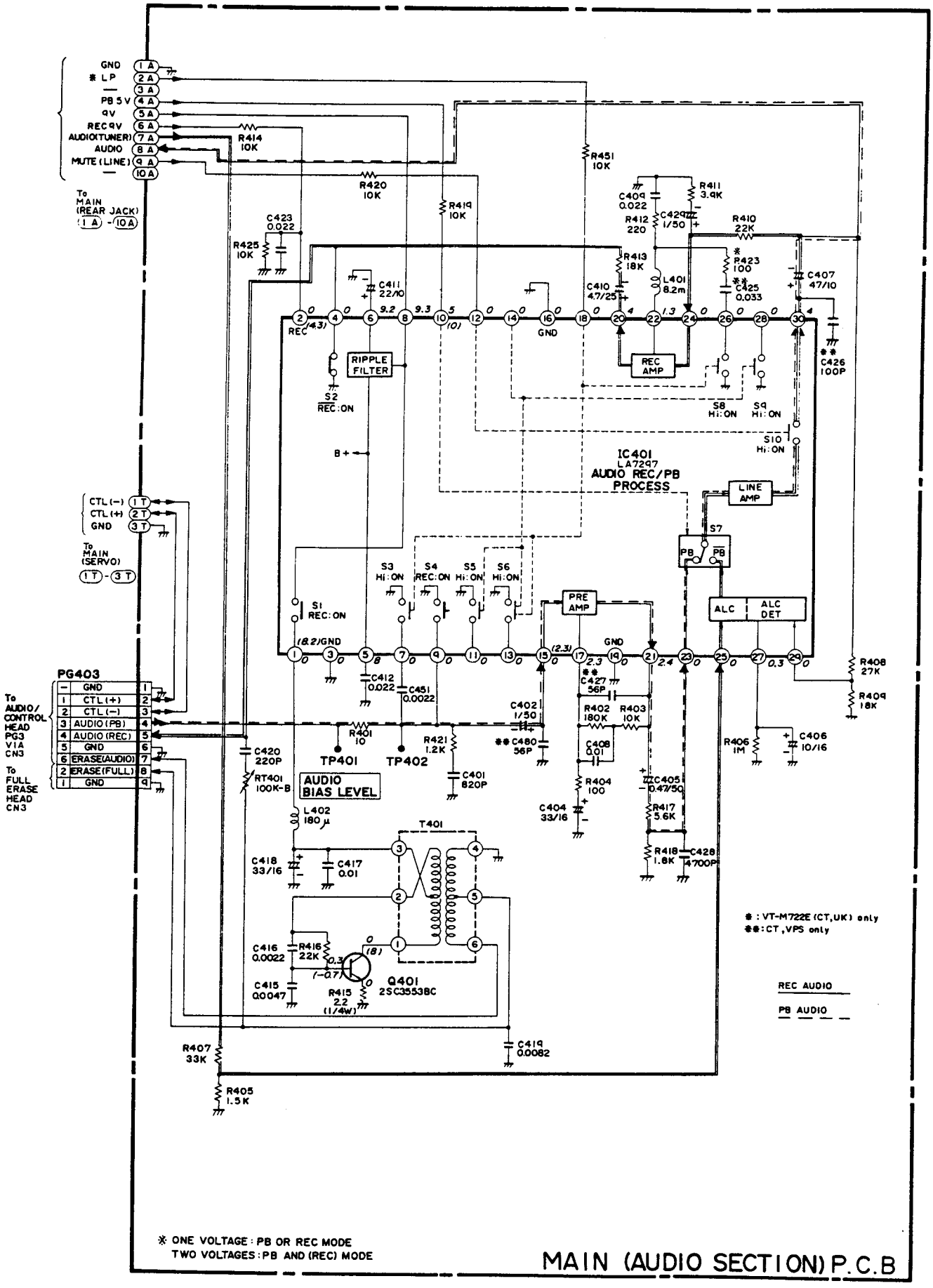
DIGITAL PROCESS CIRCUIT

A	
ADC B-Y	Analog to Digital Converted B-Y Signal
ADC R-Y	Analog to Digital Converted R-Y Signal
ADC Y	Analog to Digital Converted Luminance
ADRS	Address
C	
CAS	Column Address Strobe
C.BLANK	Chroma Blanking
D	
DRAM	Dynamic Random Access Memory
DEMPX	Demultiplexer
DWC	Delayed Write Clock
DT/OE	Date Transfer / Output Enable
D.REF 25	Delayed Reference 25Hz
D.SW 25	Delayed Switching 25Hz
I	
INC	Row Counter Increment
M	
MEM	Memory
MEM VIDEO	Memorized Video
MEM SW	Memory Switch
MEM ON	Memory ON
MPX	Multiplexer
MPX VIDEO	Multiplexed Video
O	
O/E	Odd/Even Field
P	
P IN P	Picture in Picture
PIX MOVE	Picture Move
R	
RC	Reading Clock
RCC	Reading Clock Clear
RCR	Row Counter Reset
RAS	Row Address Strobe
REF 25	Reference 25Hz from Servo Circuit
REL	Refresh Control
S	
SC	Serial Control
W	
WC	Write Clock
WCC	Write Clock Clear
WRITE ENBL (WE)	Write Enable

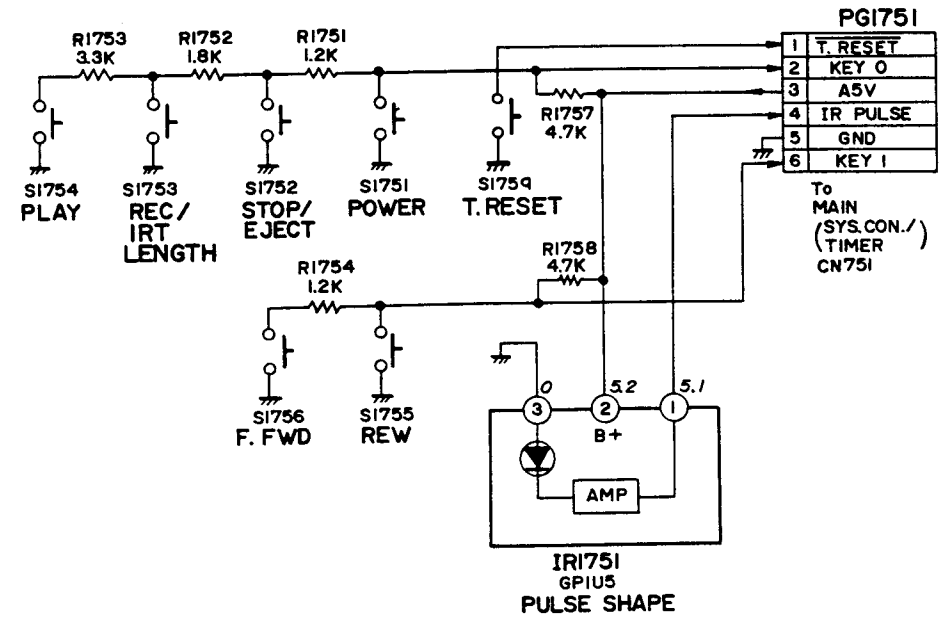
INTERNAL WIRING DIAGRAM



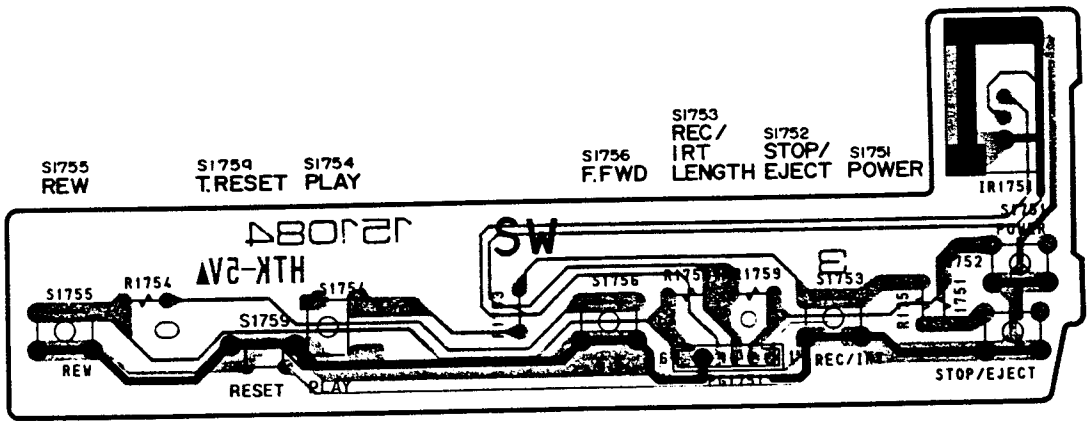
AUDIO (MAIN) SCHEMATIC DIAGRAM



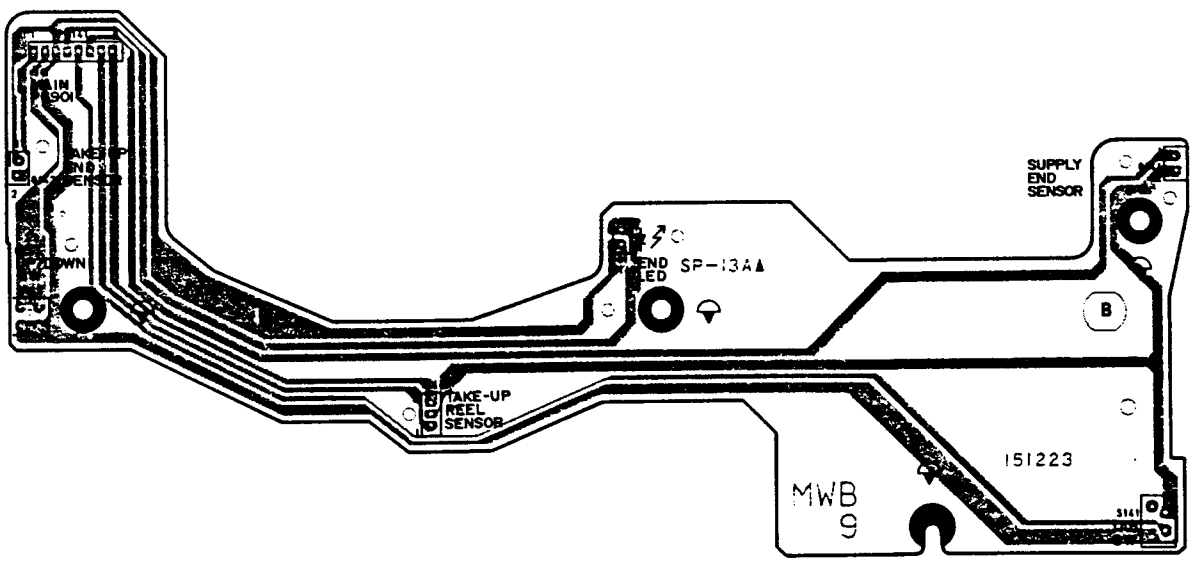
FUNCTION SWITCH SCHEMATIC DIAGRAM



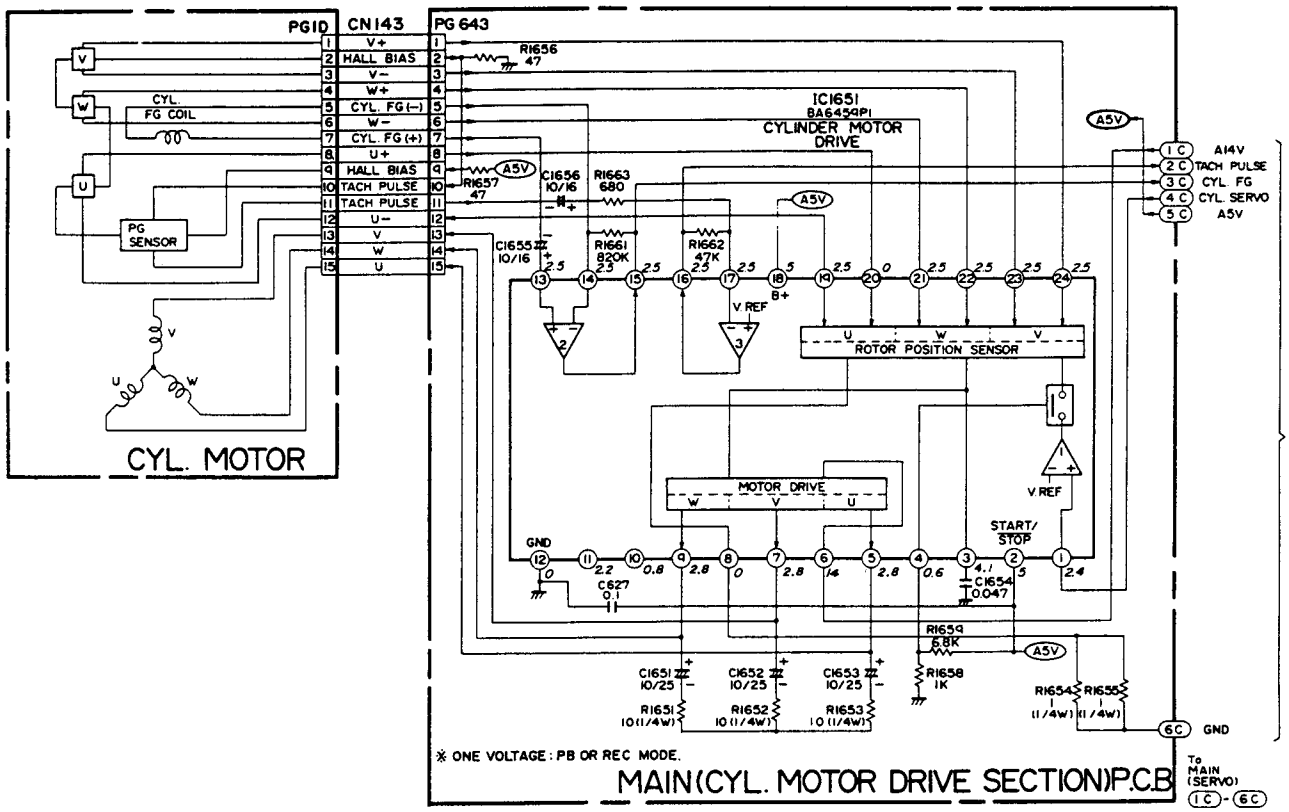
FUNCTION SWITCH CIRCUIT BOARD DIAGRAM



SENSOR CIRCUIT BOARD DIAGRAM



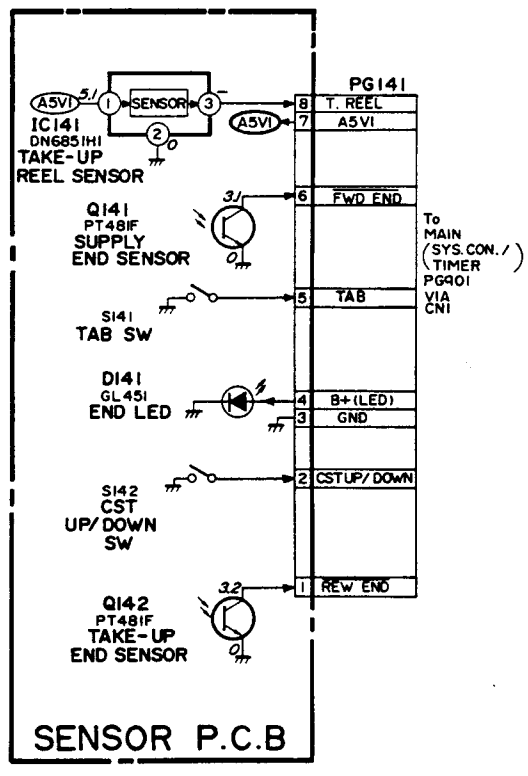
CYL. MOTOR DRIVE (MAIN) SCHEMATIC DIAGRAM



SERVO WAVEFORMS

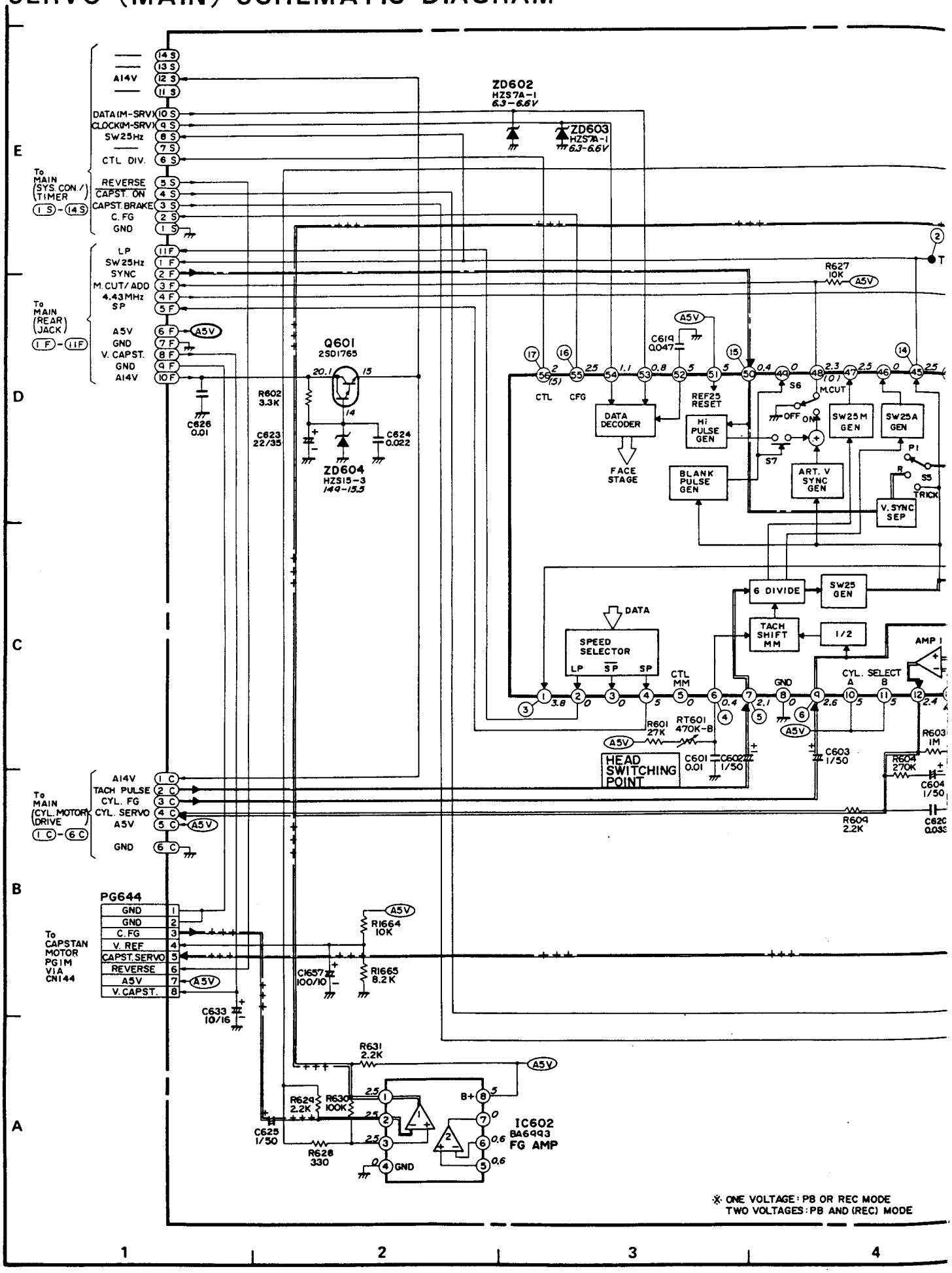
1-B TP604 980mVp-p 0.2V/10.0m sec. cm PLAY	2-A TP606 5.1Vp-p 1V/5.0m sec. cm REC/PLAY	3-A IC601-1 5.1Vp-p 1V/10.0m sec. cm REC/PLAY	4-A IC601-6 2.4Vp-p 0.5V/2.0m sec. cm REC/PLAY
5-A IC601-7 2.3Vp-p 0.5V/10.0m sec. cm REC/PLAY	6-A IC601-9 3.5Vp-p 1V/2.0m sec. cm REC/PLAY	7-A IC601-29 4.1Vp-p 1V/10.0m sec. cm REC	8-A IC601-30 2.5Vp-p 0.5V/10.0m sec. cm REC
9-B IC601-34 950mVp-p 0.2V/10.0m sec. cm PLAY	10-B IC601-35 950mVp-p 0.2V/10.0m sec. cm PLAY	11-B IC601-36 950mVp-p 0.2V/10.0m sec. cm PLAY	12-A IC601-39 5.1Vp-p 1V/10.0m sec. cm REC/PLAY
13-A IC601-42 760mVp-p 0.2V/200n sec. cm REC/PLAY	14-A IC601-45 5.0Vp-p 1V/5.0m sec. cm REC/PLAY	15-A IC601-50 4.6Vp-p 1V/5.0m sec. cm REC/PLAY	16-A IC601-55 5.0Vp-p 1V/500μ sec. cm REC/PLAY
17-A IC601-56 5.0Vp-p 1V/5.0m sec. cm REC/PLAY			

SENSOR SCHEMATIC DIAGRAM

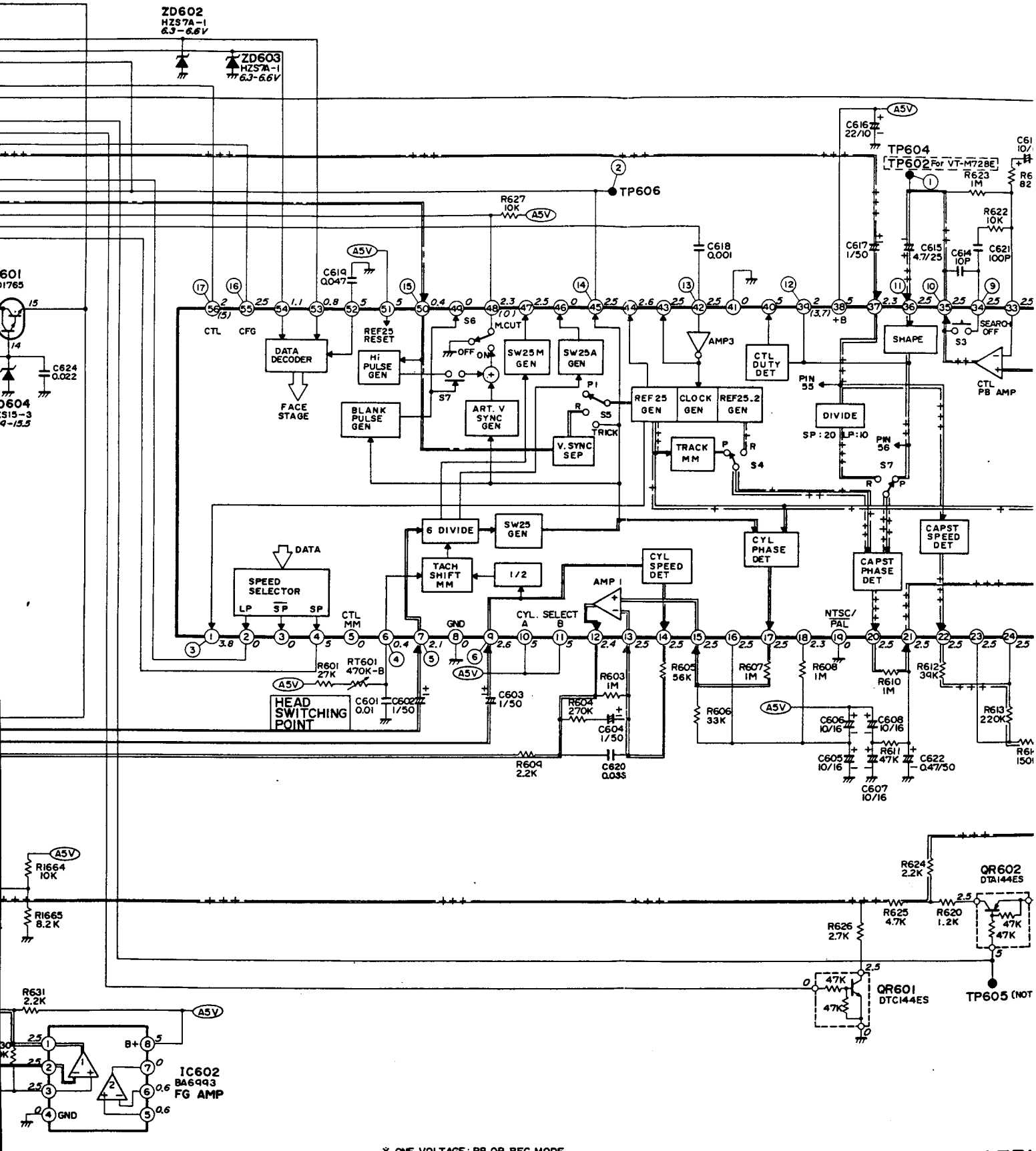


1 2 3 4

SERVO (MAIN) SCHEMATIC DIAGRAM



IATIC DIAGRAM

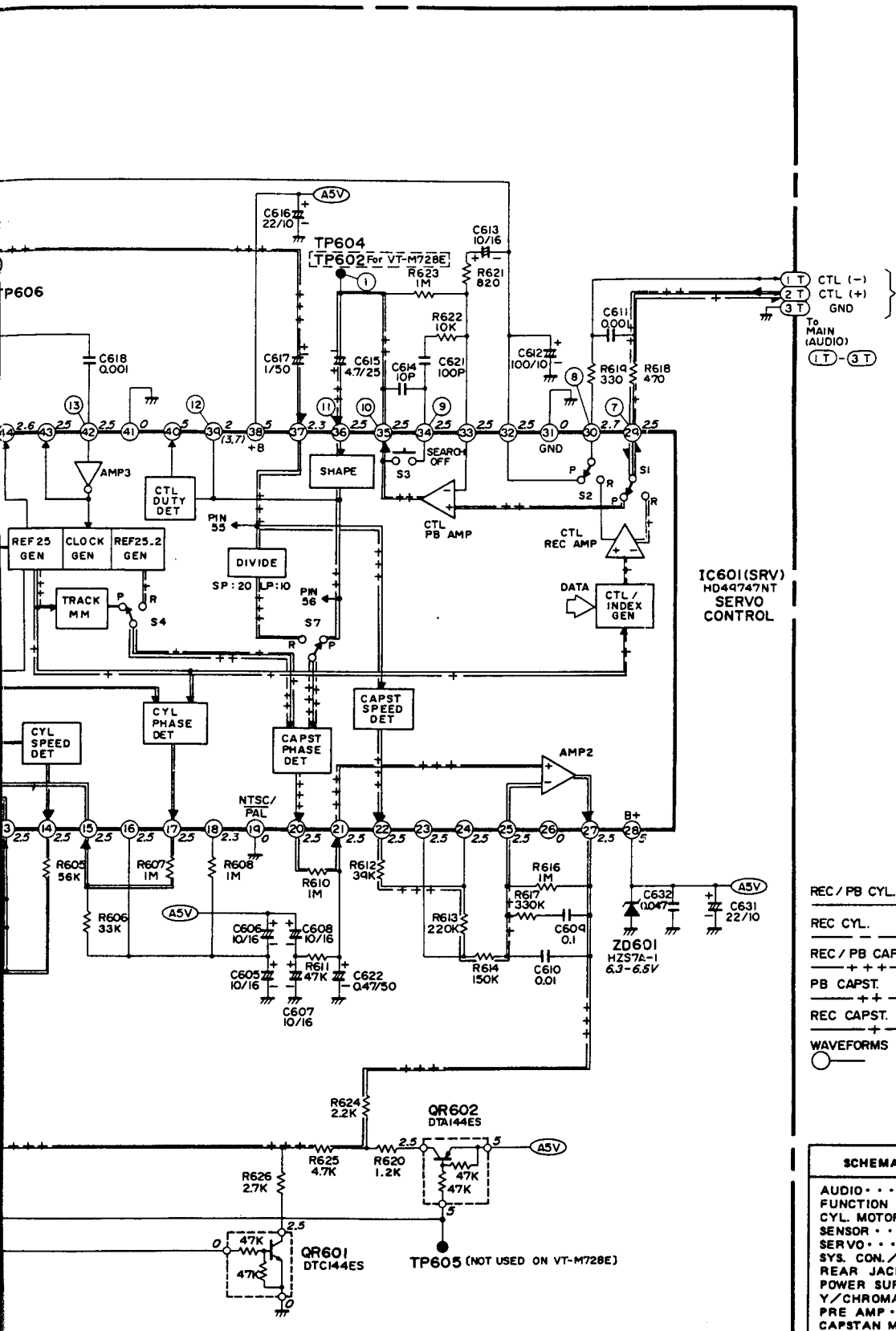


※ ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES : PB AND (REC) MODE

MAIN (SERV

2 | 3 | 4 | 5

SERVO 5 – 8 5 – 9 SERVO



REC / PB CYL.

REC CYL.

REC / PB CAPST.

PB CAPST.

REC CAPST.

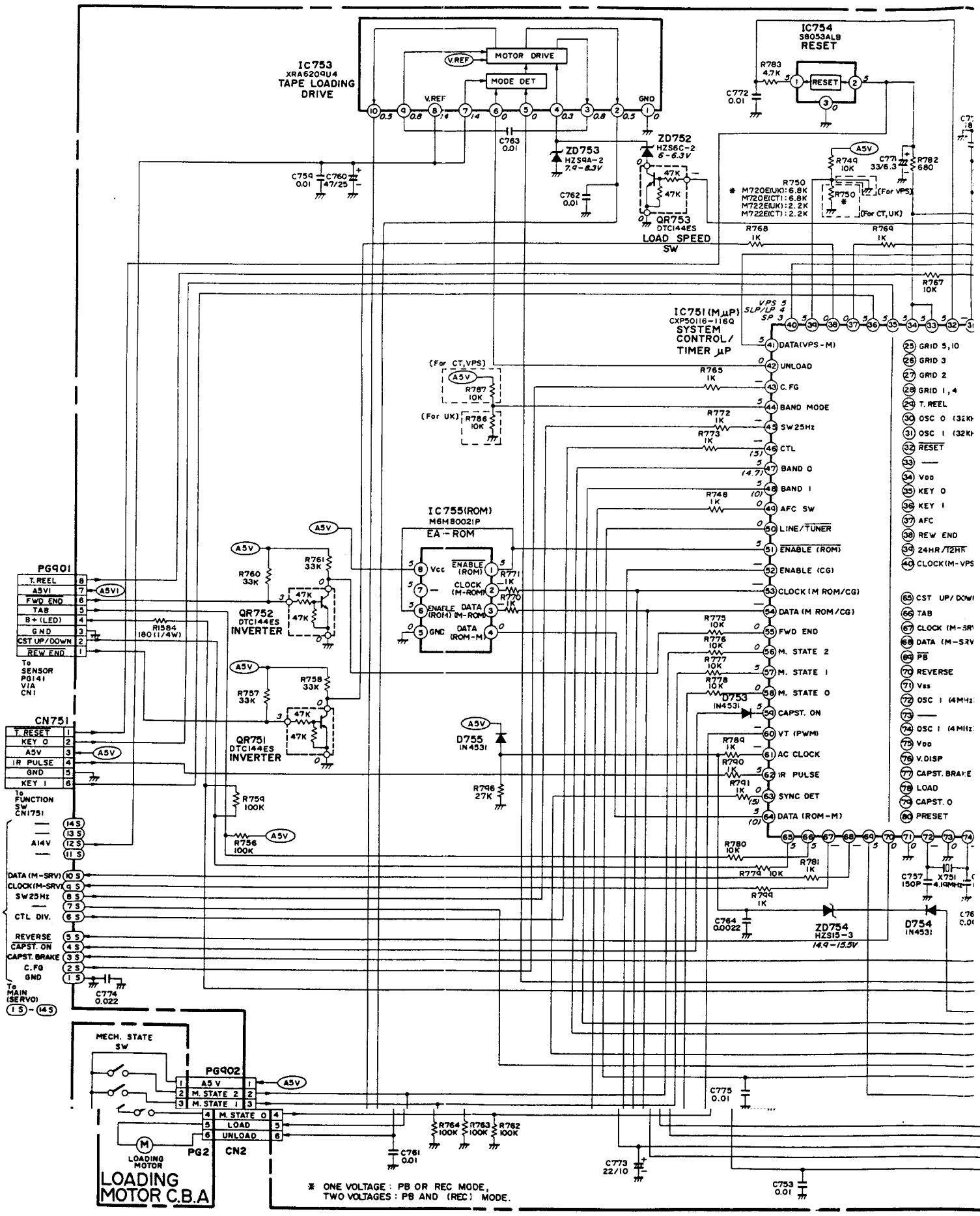
WAVEFORMS NO.

SCHEMATIC DIAGRAM	ITEM
AUDIO	5-5
FUNCTION SWITCH	5-6
CYL. MOTOR DRIVE	5-7
SENSOR	5-7
SERVO	5-8
SYS. CON. / TIMER	5-10
REAR JACK	5-12
POWER SUPPLY	5-14
Y/CHROMA	5-18
PRE AMP	5-22
CAPSTAN MOTOR	5-22
RF CONVERTER (For UK)	5-23
RF CONVERTER (For CT)	5-23
RF CONVERTER (For VPS)	5-24
REMOTE CONTROL	5-25
TUNER (For UK)	5-26
TUNER (For CT, VPS)	5-27
IF (For UK)	5-28
IF (For CT, VPS)	5-29

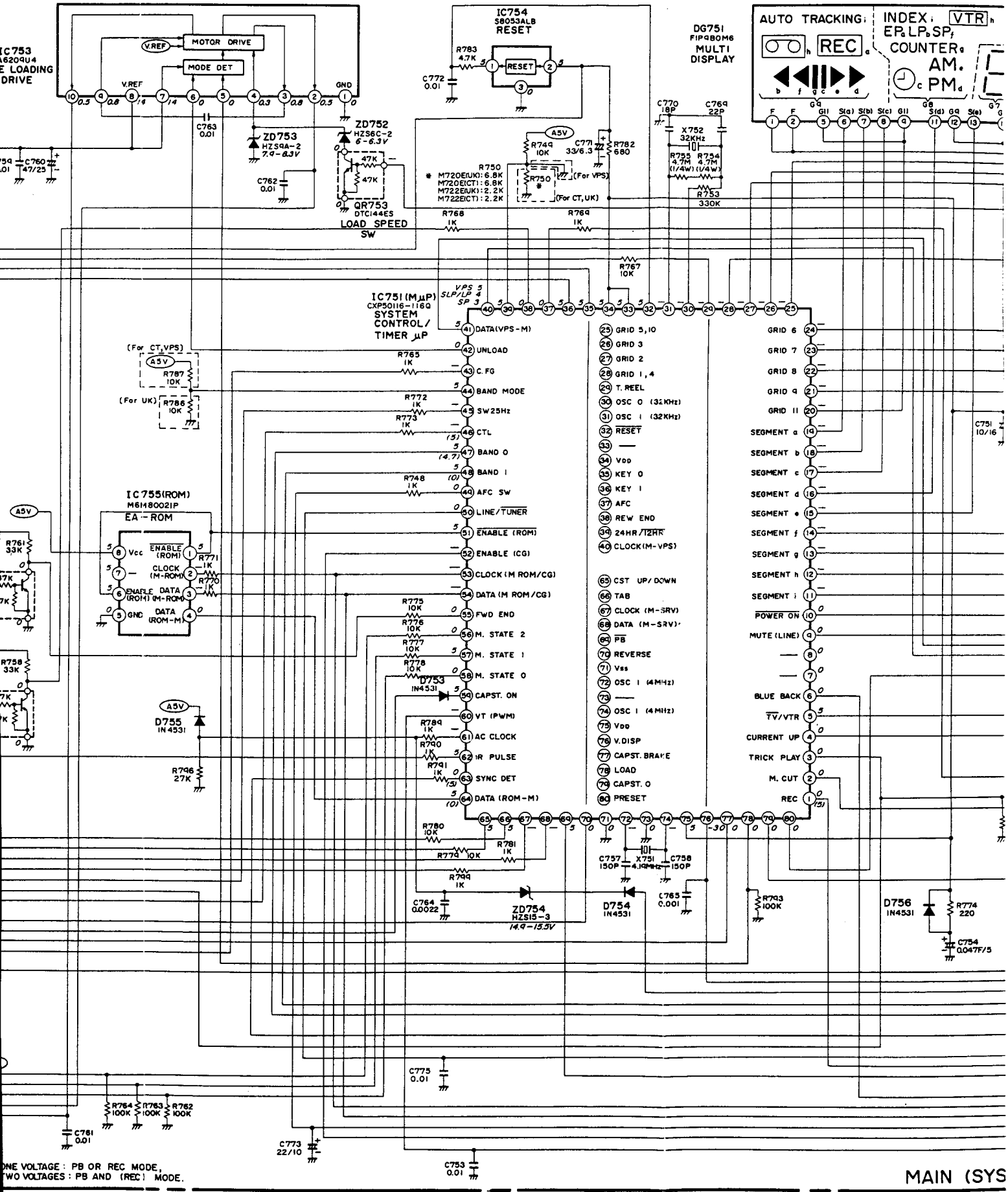
MAIN (SERVO SECTION) P.C.B

5 6 7 8

SYSTEM CONTROL/TIMER (MAIN) SCHEMATIC DIAGRAM



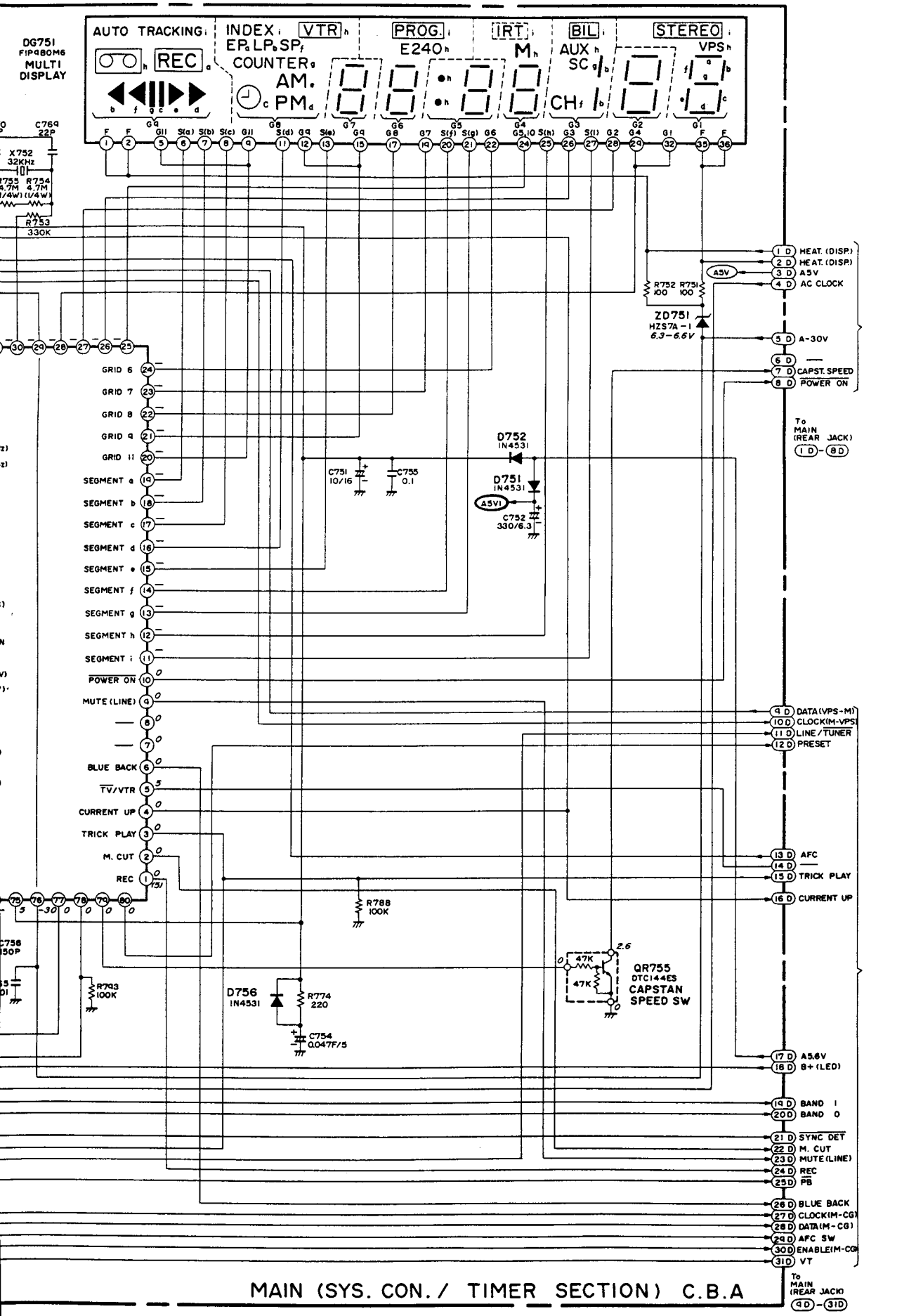
MER (MAIN) SCHEMATIC DIAGRAM



ONE VOLTAGE : PB OR REC MODE,
TWO VOLTAGES : PB AND (REC) MODE.

MAIN (SYS

2 3 4 5

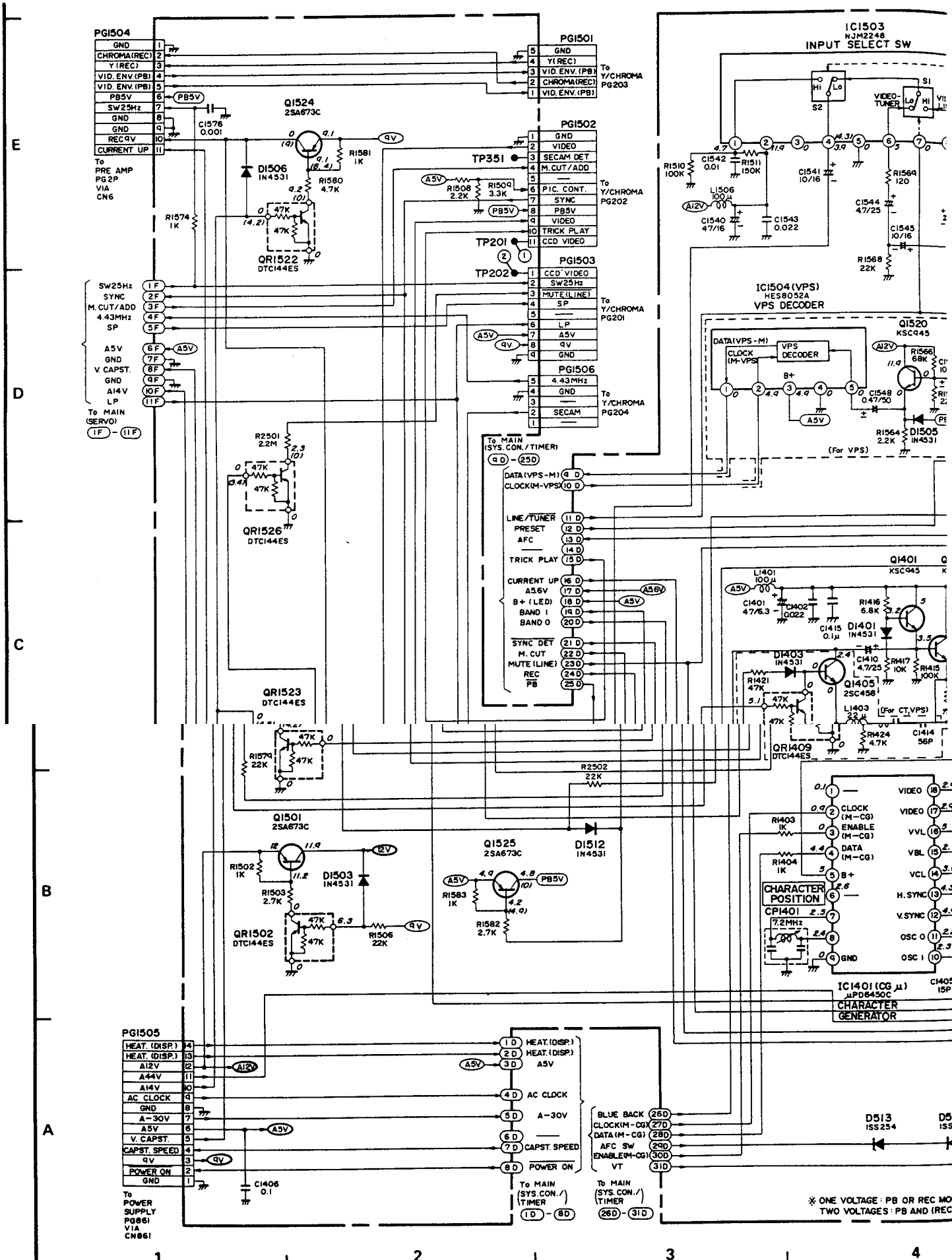


MAIN (SYS. CON. / TIMER SECTION) C.B.A

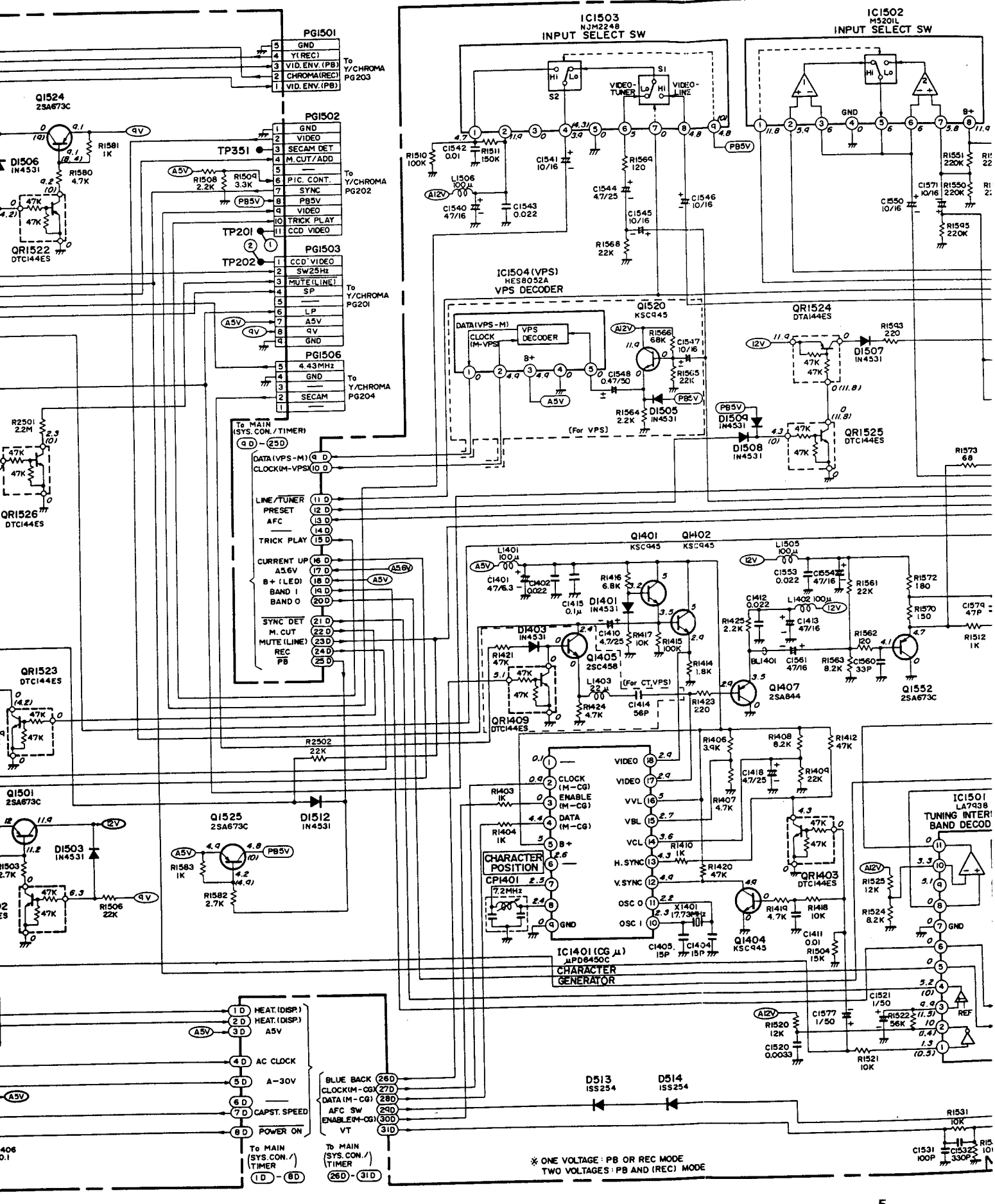
5 6 7 8

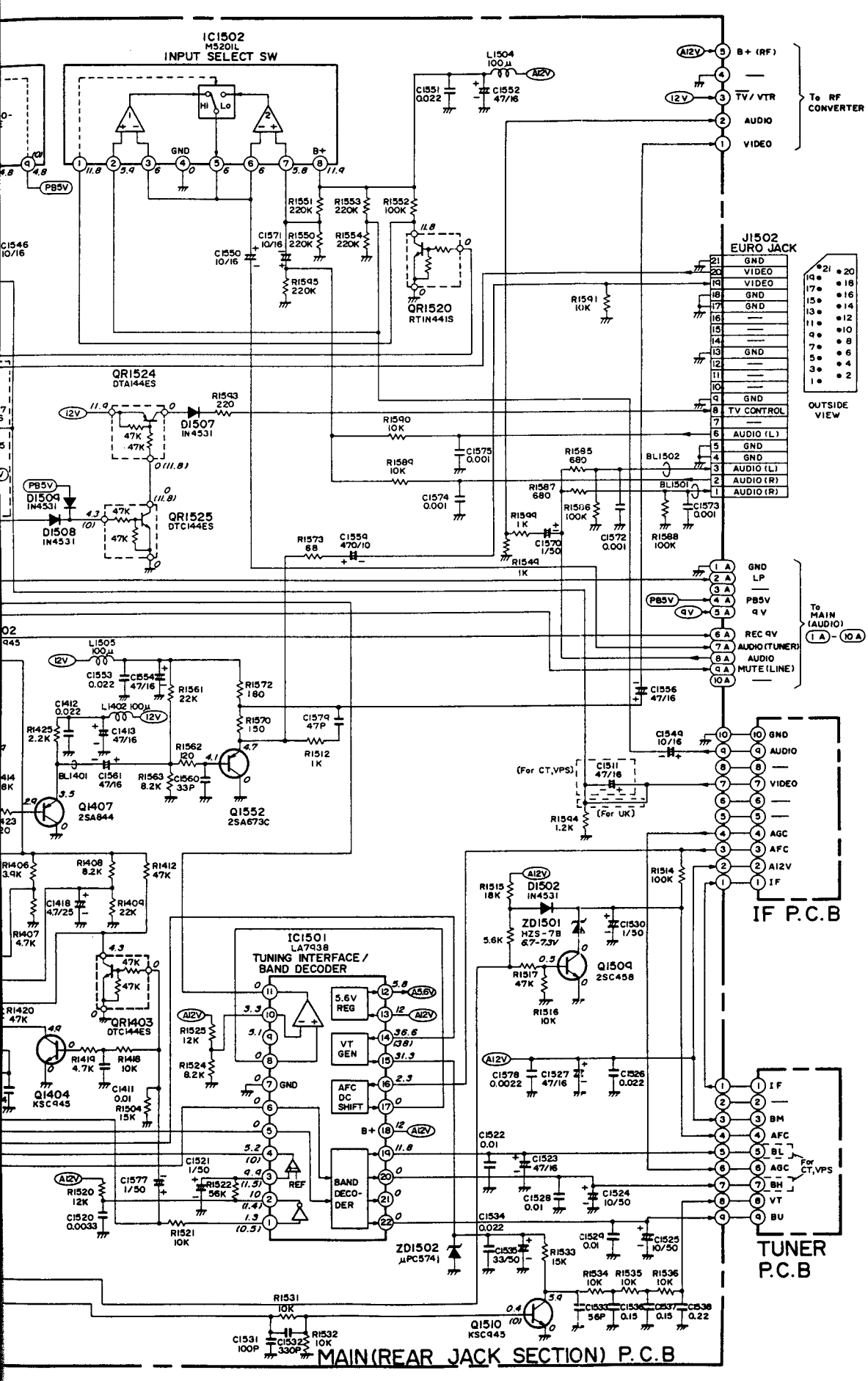
1 SYS. CON./TIMER

REAR JACK (MAIN) SCHEMATIC DIAGRAM



IN) SCHEMATIC DIAGRAM

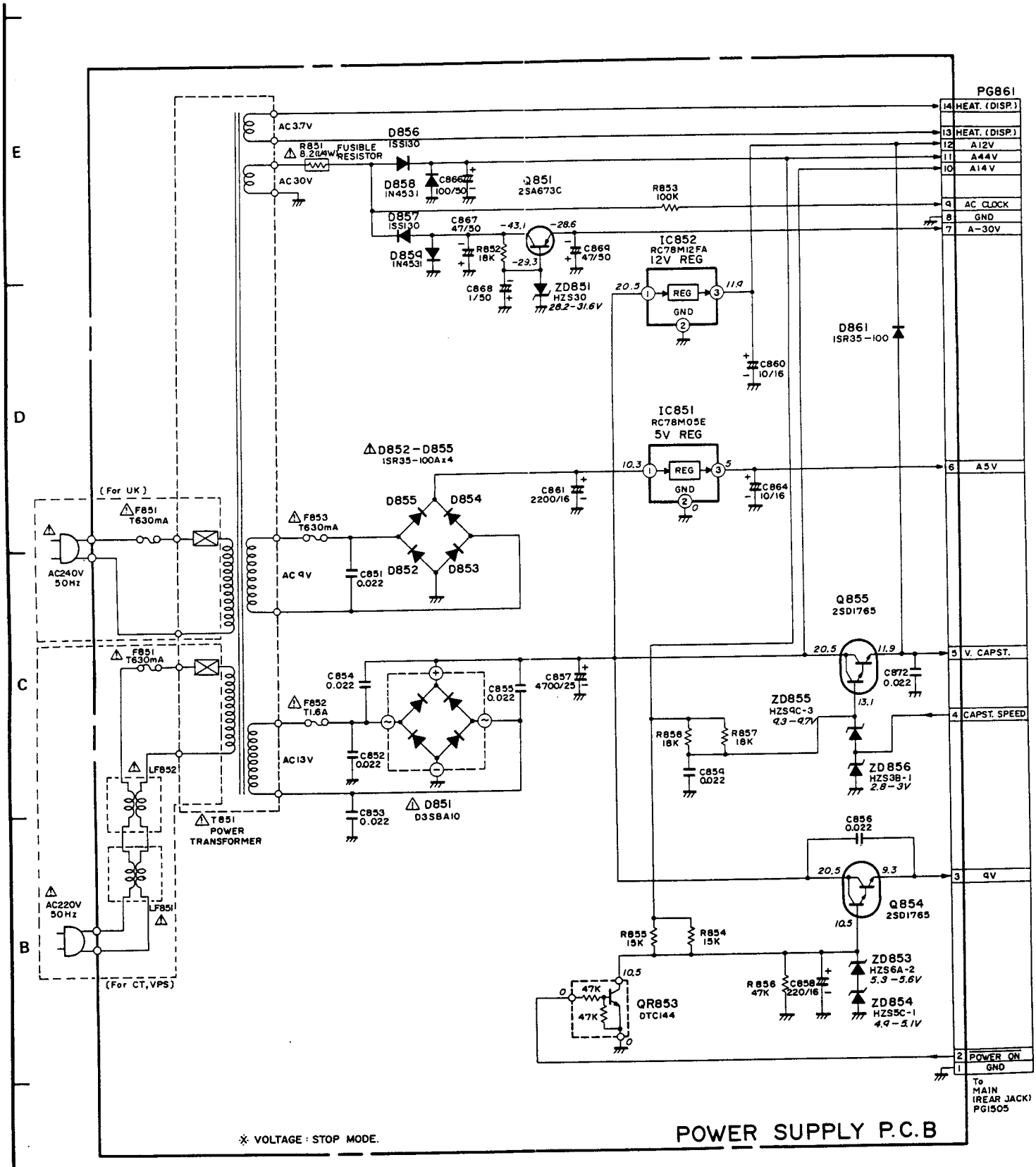


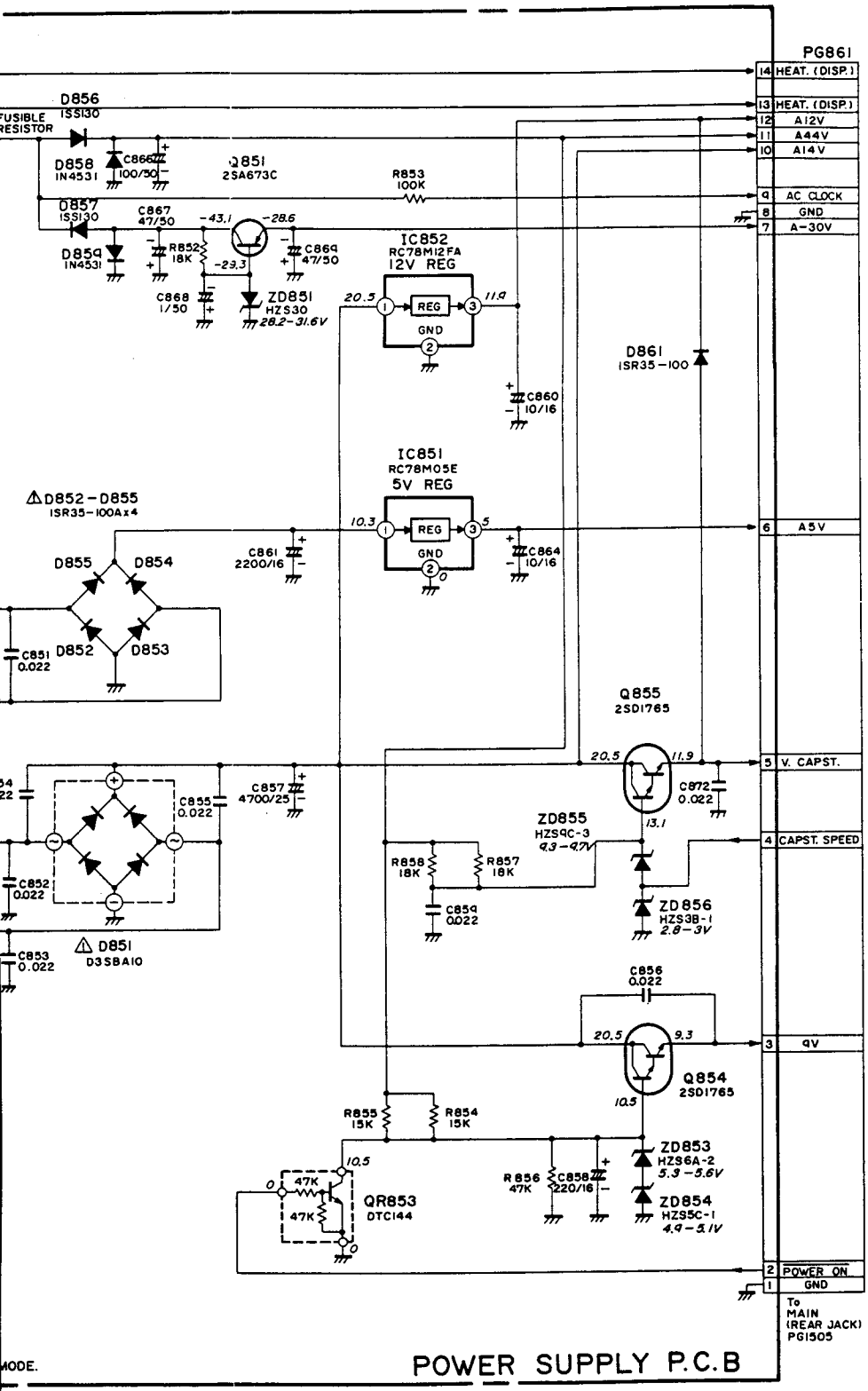


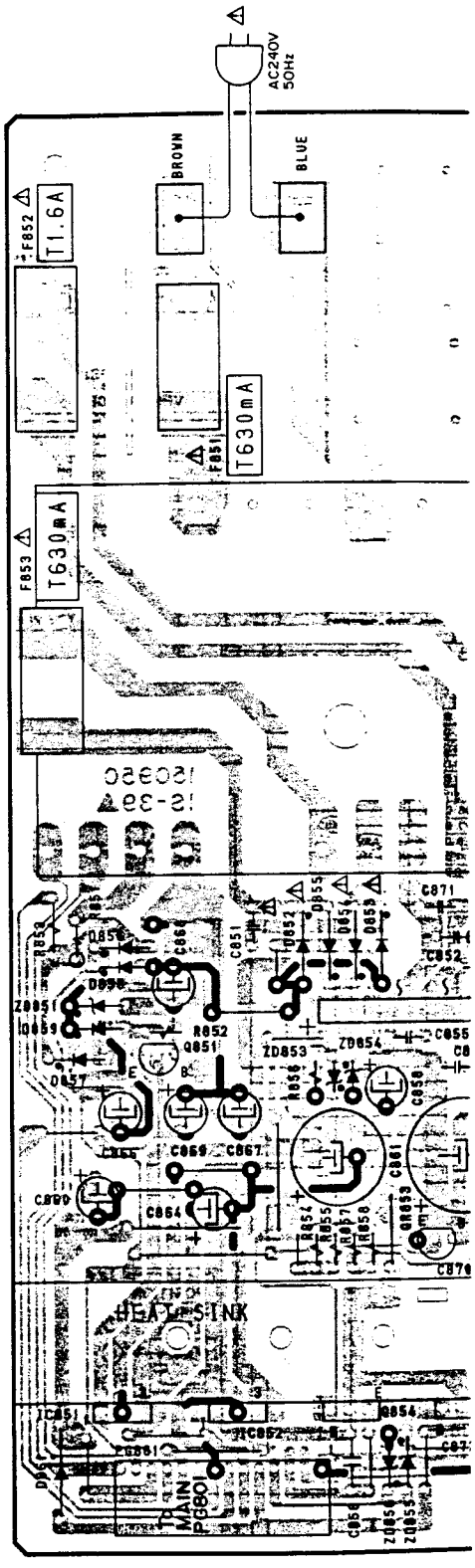
5 6 7 8

5 – 1 3 REAR JACK

POWER SUPPLY SCHEMATIC DIAGRAM

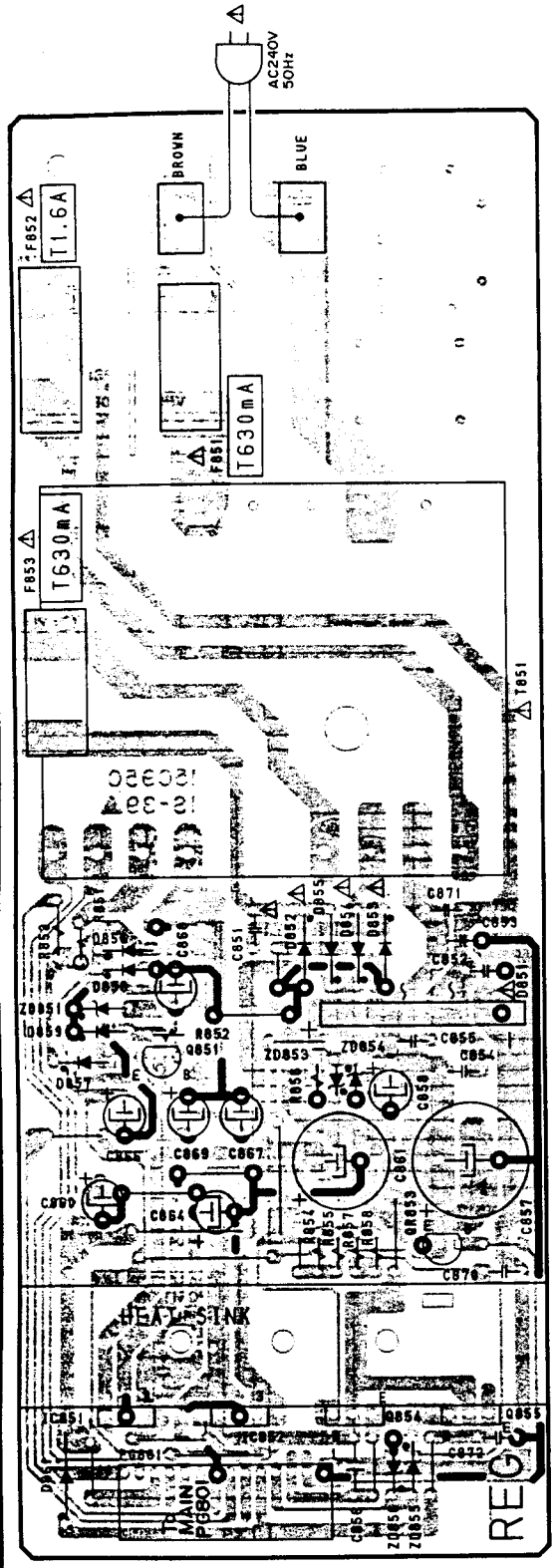



PG861
14 HEAT. (DISP.)
13 HEAT. (DISP.)
12 A12V
11 A44V
10 A14V
9 AC CLOCK
8 GND
7 A-30V
6 A5V
5 V. CAPST.
4 CAPST. SPEED
3 9V
2 POWER ON
1 GND
D856 1SS130
D858 1N4531
D857 1SS130
D859 1N4531
C866 100/50
C867 47/50
C869 47/50
C868 1/50
Q851 2SA673C
R853 100K
R852 18K
-43.1
-28.6
-29.3
IC852 RC78M12FA 12V REG
ZD851 HZS30 28.2-31.6V
20.5
11.9
C860 10/16
D861 1SR35-100
IC851 RC78M05E 5V REG
10.3
5
C861 2200/16
C864 10/16
⚠D852-D855 1SR35-100Ax4
D855 D854 D852 D853
C851 0.022
Q855 2SD1765
20.5
11.9
C872 0.022
13.1
C855 0.022
C857 4700/25
C852 0.022
C853 0.022
⚠ D851 D3SBA10
ZD855 HZS9C-3 9.3-9.7V
R858 18K
R857 18K
C859 0.022
ZD856 HZS3B-1 2.8-3V
C856 0.022
20.5
9.3
Q854 2SD1765
10.5
R855 15K
R854 15K
10.5
47K
47K
QR853 DTC144
R856 47K
C858 220/16
ZD853 HZS6A-2 5.3-5.6V
ZD854 HZS5C-1 4.9-5.1V
To MAIN (REAR JACK) PG1505
MODE.
POWER SUPPLY P.C.B

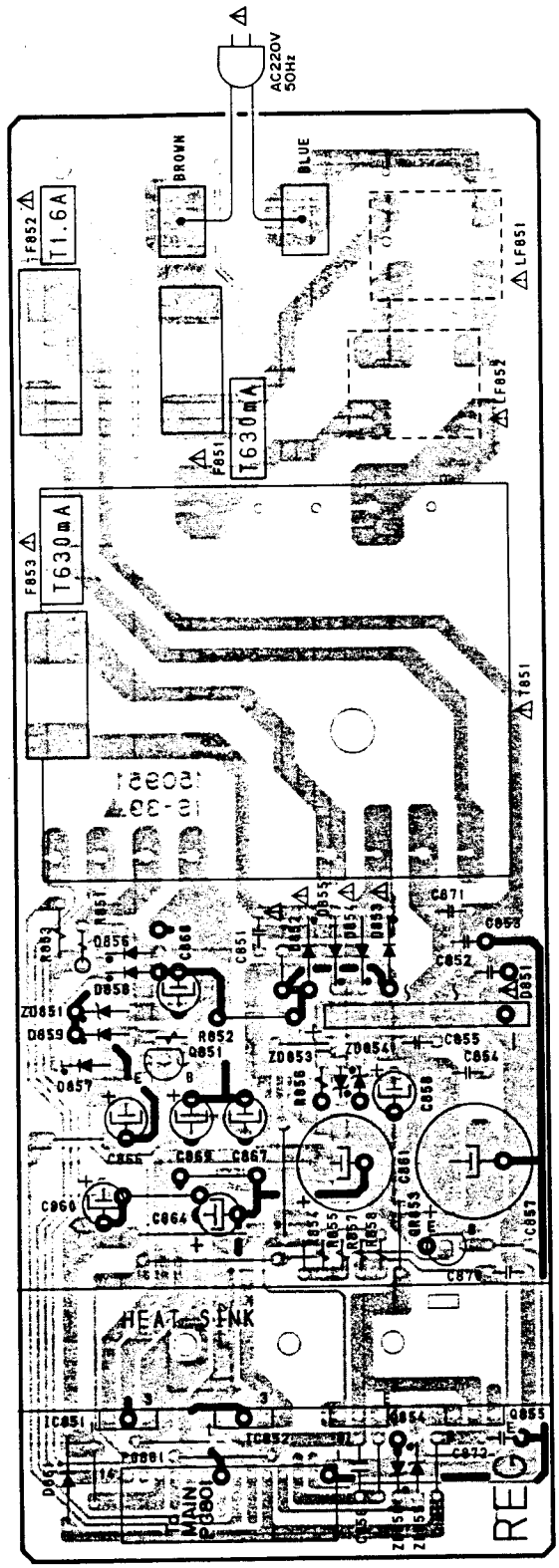

AC240V 50Hz
BROWN
BLUE
F852 T1.6A
F851 T630mA
F853 T630mA
HEAT SINK
MAIN PG801

(For UK)

POWER SUPPLY CIRCUIT BOARD DIAGRAMS

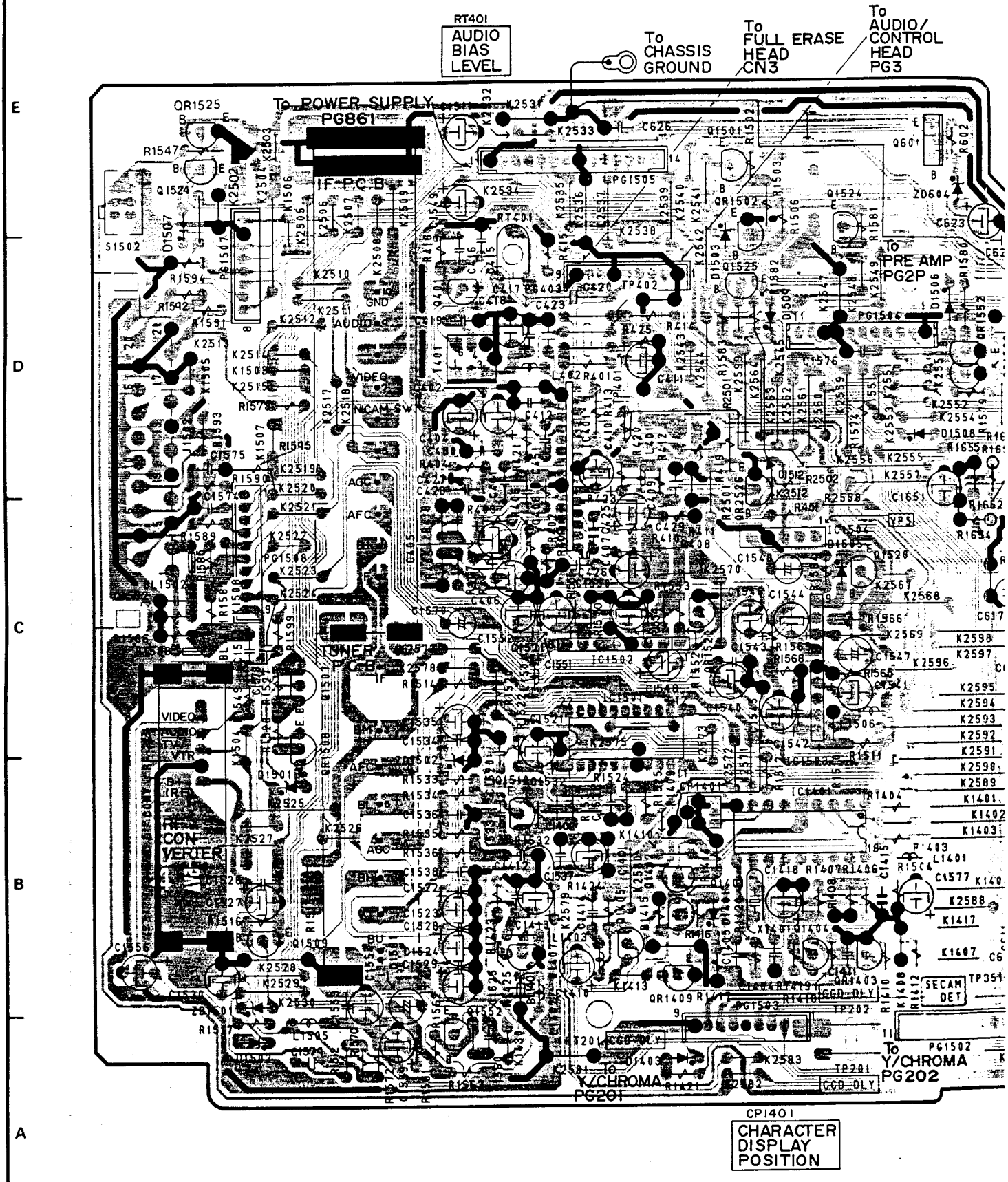


(For UK)

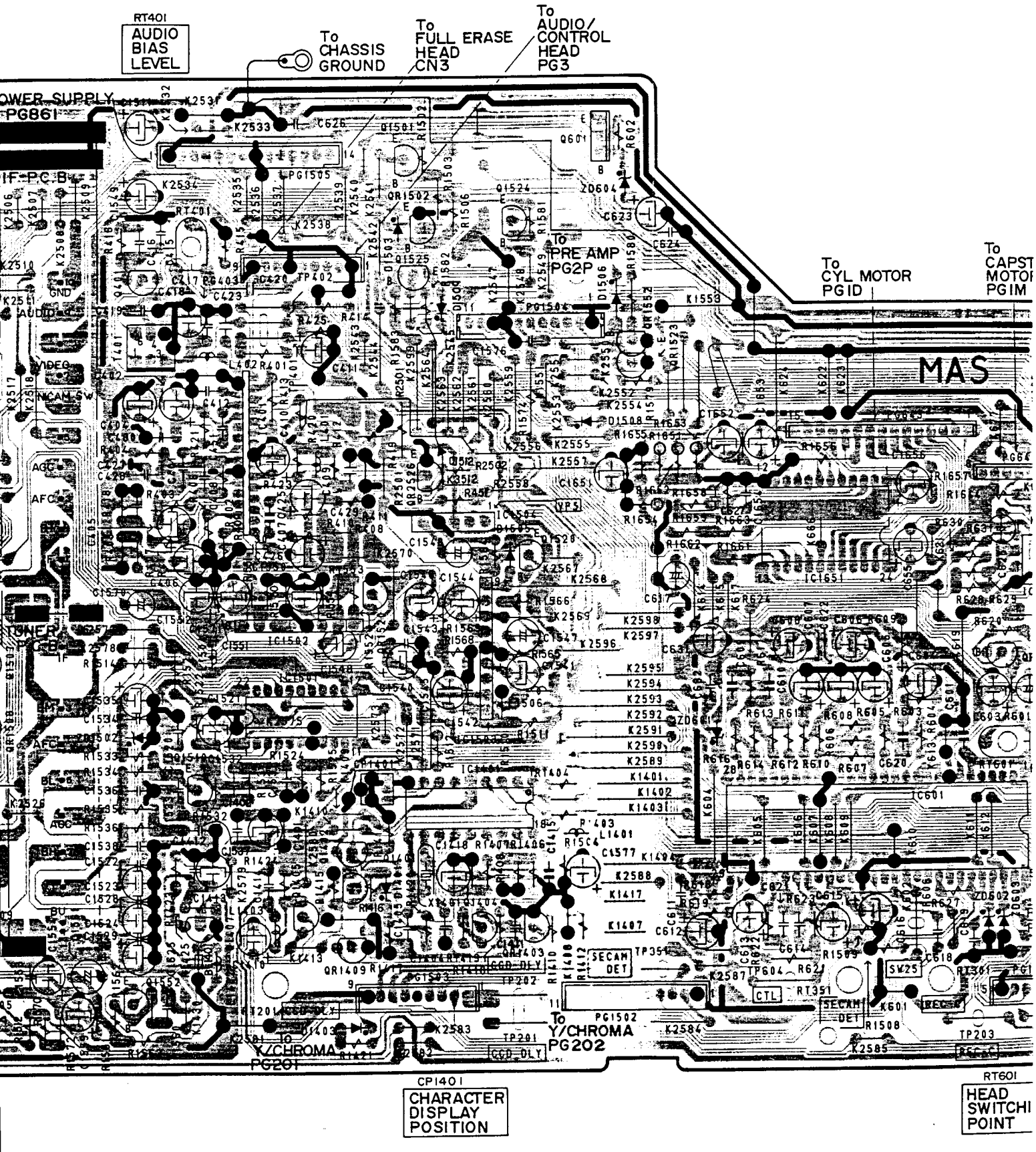


(For CT, VPS)

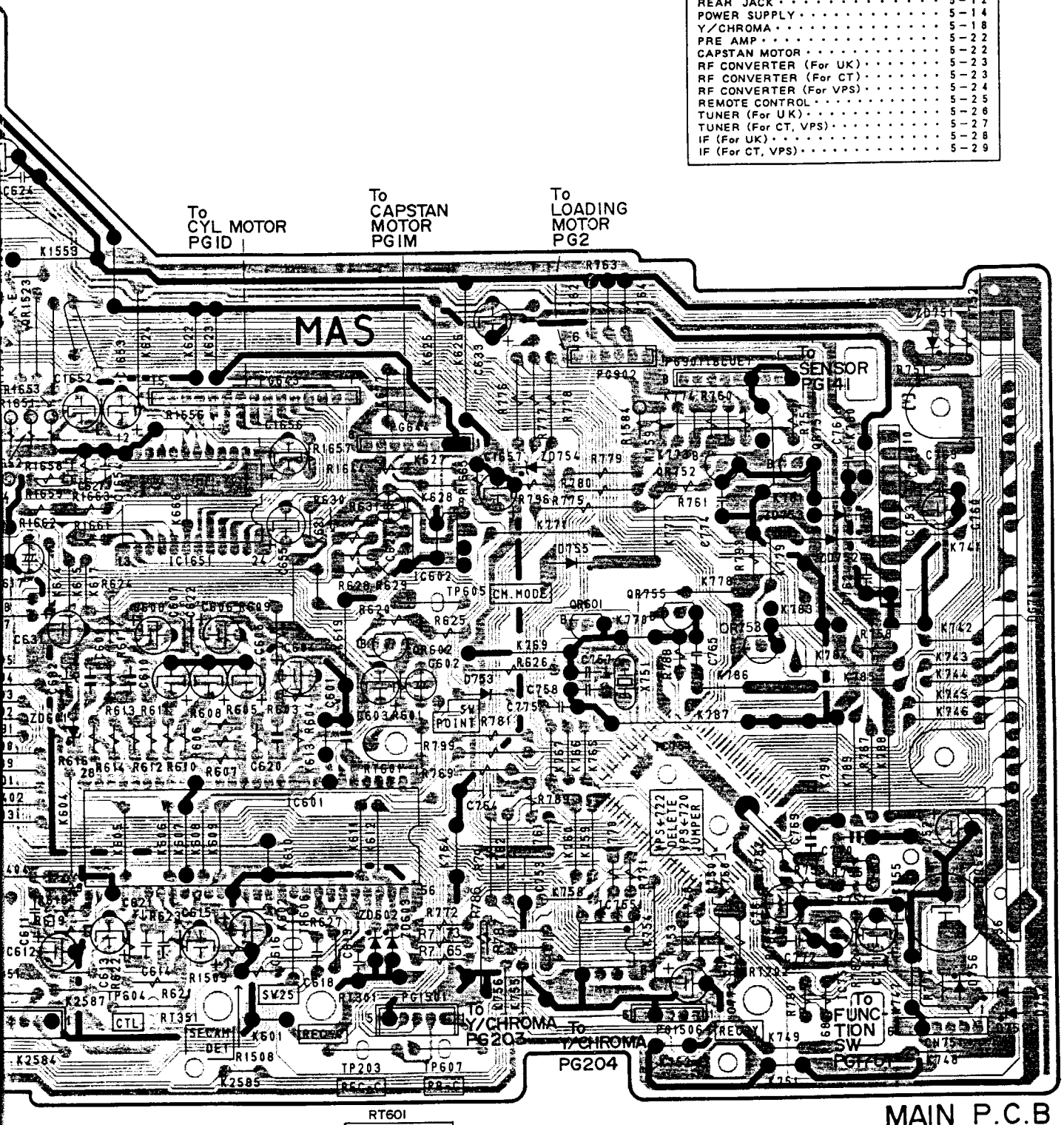
MAIN CIRCUIT BOARD DIAGRAM



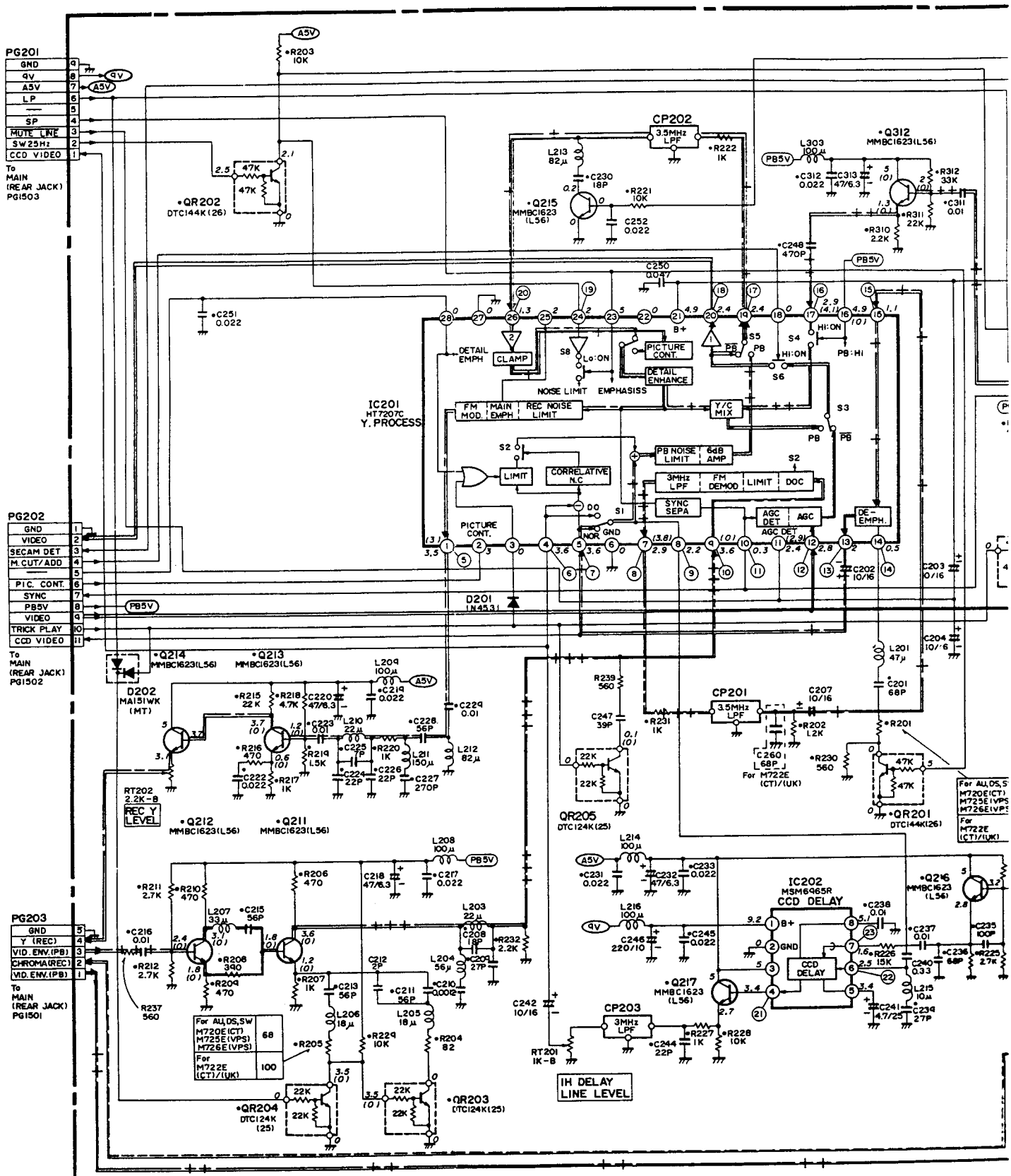
RD DIAGRAM


RT401
AUDIO BIAS LEVEL
To CHASSIS GROUND
To FULL ERASE HEAD CN3
To AUDIO/ CONTROL HEAD PG3
To PRE AMP PG2P
To CYL MOTOR PGID
To CAPST MOTOR PGIM
MAS
To Y/CHROMA PG201
To PG1502 Y/CHROMA PG202
CP1401
CHARACTER DISPLAY POSITION
RT601
HEAD SWITCHI POINT
SECAM DET
CTL

SCHEMATIC DIAGRAM	ITEM
AUDIO	5 – 5
FUNCTION SWITCH	5 – 6
CYL. MOTOR DRIVE	5 – 7
SENSOR	5 – 7
SERVO	5 – 8
SYS. CON./TIMER	5 – 10
REAR JACK	5 – 12
POWER SUPPLY	5 – 14
Y/CHROMA	5 – 18
PRE AMP	5 – 22
CAPSTAN MOTOR	5 – 22
RF CONVERTER (For UK)	5 – 23
RF CONVERTER (For CT)	5 – 23
RF CONVERTER (For VPS)	5 – 24
REMOTE CONTROL	5 – 25
TUNER (For UK)	5 – 26
TUNER (For CT, VPS)	5 – 27
IF (For UK)	5 – 28
IF (For CT, VPS)	5 – 29

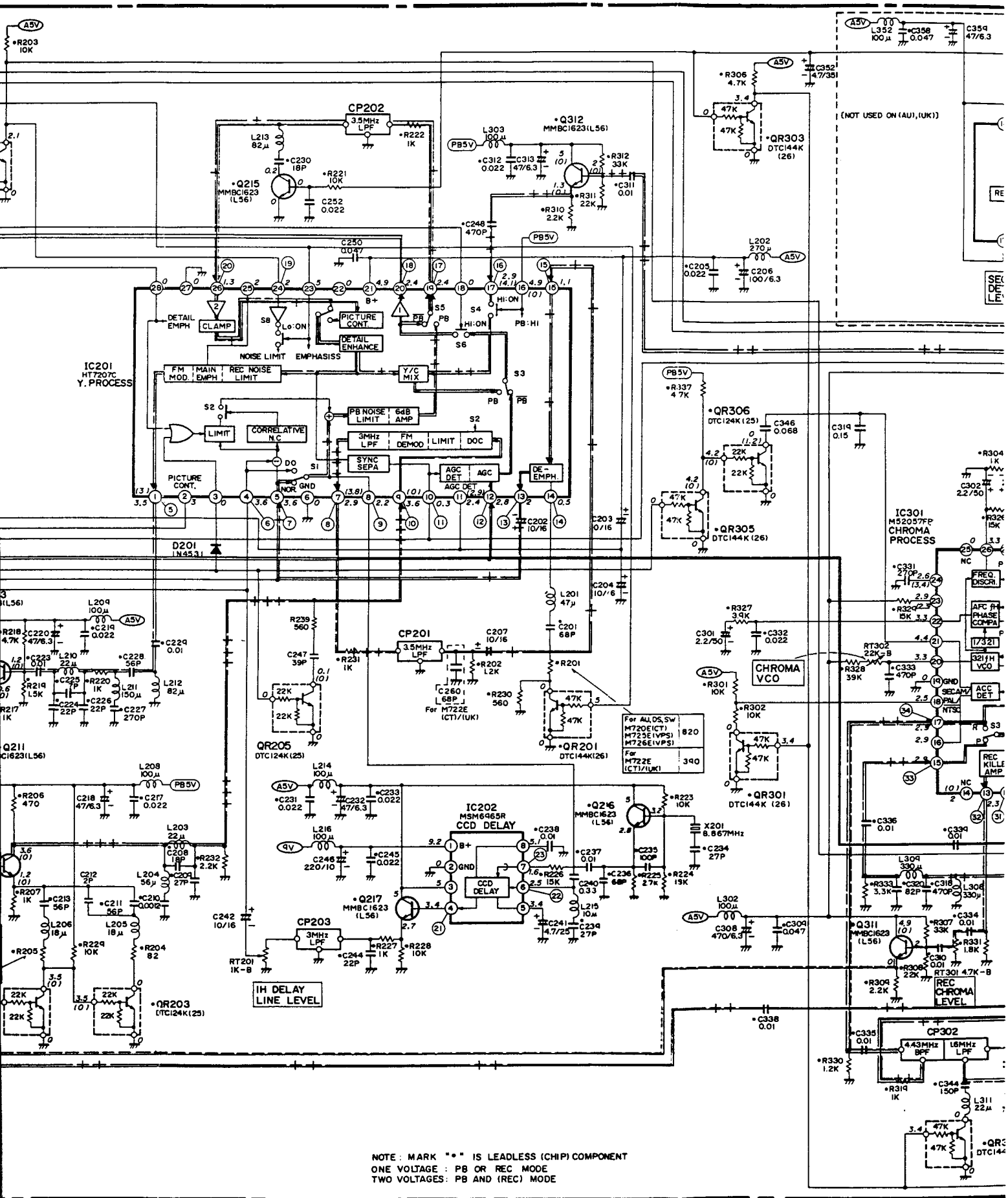


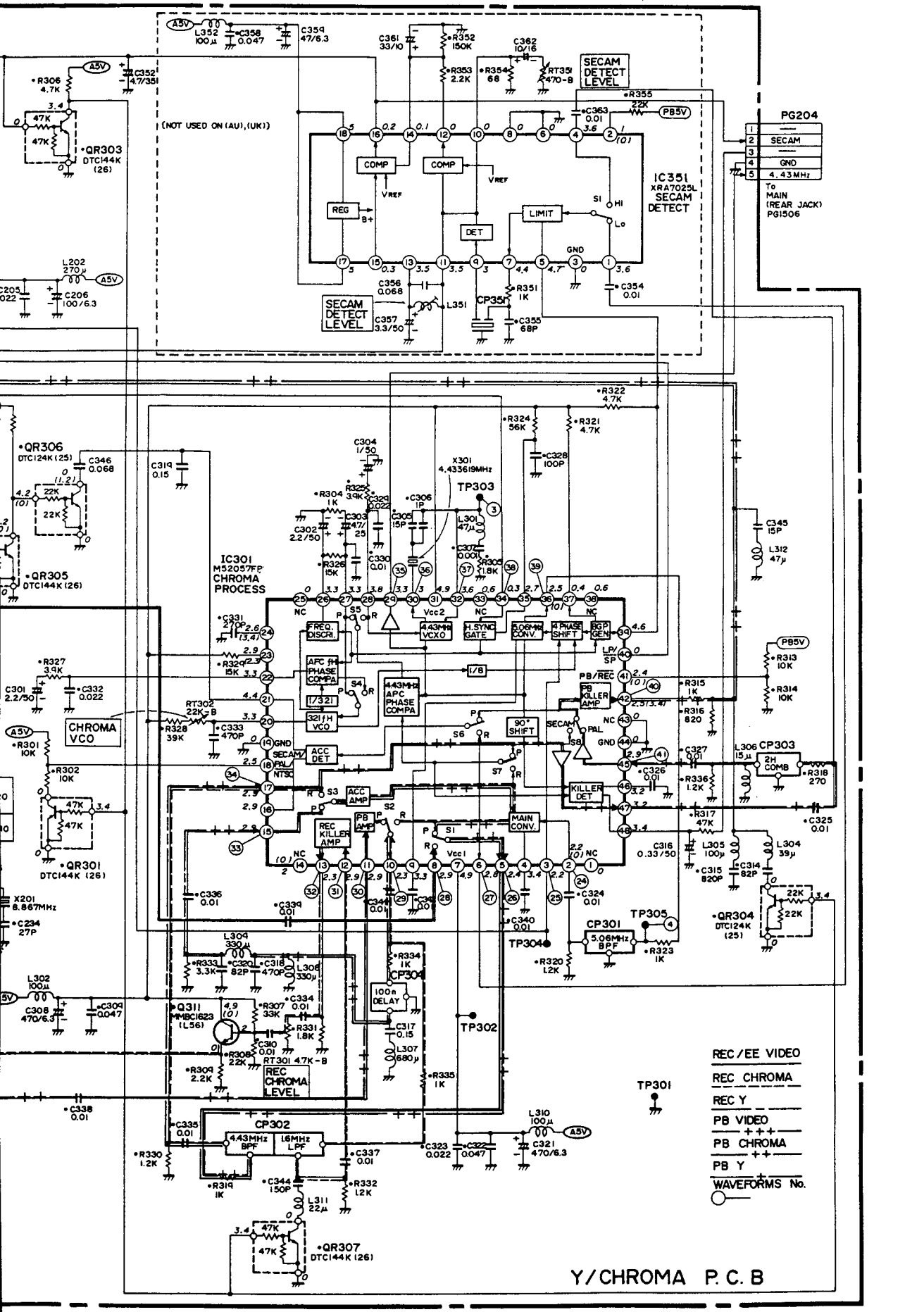
Y/CHROMA SCHEMATIC DIAGRAM



NOTE : MARK "•" IS LEADLESS (CHIP) COMPONENT.
ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES: PB AND (REC) MODE

TIC DIAGRAM


IC201
HT7207C
Y. PROCESS
IC202
MSM6965R
CCD DELAY
IC301
M52057FP
CHROMA
PROCESS
CP202
3.5MHz LPF
CP201
3.5MHz LPF
CP203
3MHz LPF
CP302
4.43MHz BPF
1.6MHz LPF
QR205
DTC124K(25)
QR203
DTC124K(25)
QR201
DTC144K(26)
QR303
DTC144K (26)
QR306
DTC124K (25)
QR305
DTC144K (26)
QR301
DTC144K (26)
Q215
MMBC1623 (L56)
Q312
MMBC1623(L56)
Q216
MMBC1623 (L56)
Q217
MMBC1623 (L56)
Q311
MMBC1623 (L56)
D201
1N4531
CHROMA VCO
IH DELAY LINE LEVEL
REC CHROMA LEVEL
PICTURE CONT.
DETAIL EMPH
CLAMP
NOISE LIMIT
EMPHASIS
DETAIL ENHANCE
PICTURE CONT.
FM MOD.
MAIN EMPH
REC NOISE LIMIT
Y/C MIX
PB NOISE LIMIT
6dB AMP
LIMIT
CORRELATIVE N.C
3MHz LPF
FM DEMOD
LIMIT
DOC
SYNC SEPA
AGC DET
AGC
DE-EMPH.
CCD DELAY
FREQ. DISCRI
AFC f/f PHASE COMPA
17/32 f H VCO
ACC DET
REC KILLER AMP
(NOT USED ON (AU),(UK))
For AU,DS,SW M720E(CT) M725E(VPS) M726E(VPS) 820
For M722E (CT)/(UK) 390
NOTE : MARK "•" IS LEADLESS (CHIP) COMPONENT
ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES: PB AND (REC) MODE



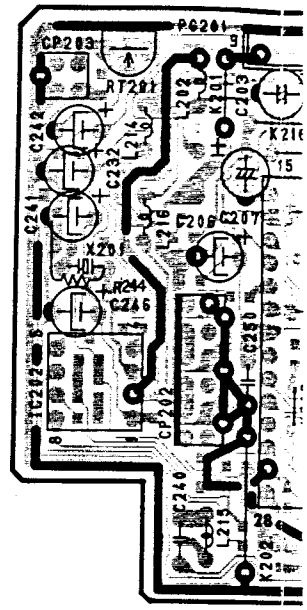
5 6 7 8

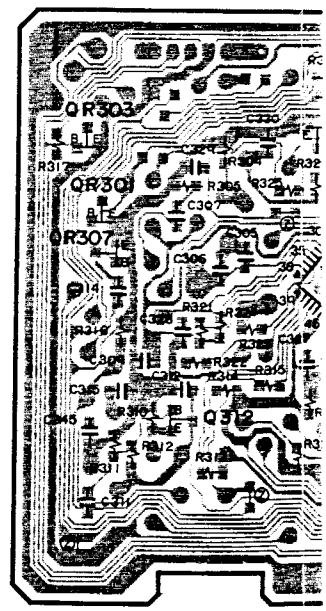
9 Y/CHROMA

Y/CHROMA WAVEFORMS

1-B TP201 450mVp-p 0.1V/200μ sec.cm PLAY	2-B TP202 450mVp-p 0.1V/20.0μ sec.cm PLAY	3-A TP303 870mVp-p 0.2V/200n sec.cm REC/PLAY	4-A TP305 400mVp-p 0.1V/200n sec.cm REC/PLAY	5-A IC201-1 640mVp-p 0.2V/20.0μ sec.cm REC	6-B IC201-4 460mVp-p 0.1V/20.0μ sec.cm PLAY
7-B IC201-5 460mVp-p 0.1V/20.0μ sec.cm PLAY	8-B IC201-7 760mVp-p 0.2V/20.0μ sec.cm PLAY	9-B IC201-8 440mVp-p 0.1V/20.0μ sec.cm PLAY	10-B IC201-9 540mVp-p 0.2V/5.0m sec.cm PLAY	11-A IC201-10 4.4Vp-p 1V/20.0μ sec.cm REC/PLAY	12-A IC201-12 500mVp-p 0.1V/20.0μ sec.cm REC/PLAY
13-B IC201-13 460mVp-p 0.1V/20.0μ sec.cm PLAY	14-B IC201-14 240mVp-p 50mV/20.0μ sec.cm PLAY	15-B IC201-15 240mVp-p 50mV/20.0μ sec.cm PLAY	16-B IC201-17 400mVp-p 0.1V/20.0μ sec.cm PLAY	17-A IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm REC	17-B IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
18-A IC201-20 1.9Vp-p 0.5V/20.0μ sec.cm REC/PLAY	19-A IC201-24 4.4Vp-p 1V/5.0m sec.cm REC/PLAY	20-A IC201-26 570mVp-p 0.2V/20.0μ sec.cm REC/PLAY	21-B IC202-4 1.5Vp-p 0.5V/20.0μ sec.cm PLAY	22-B IC202-6 430mVp-p 0.1V/20.0μ sec.cm PLAY	23-A IC202-7 230mVp-p 50mV/100n sec.cm REC/PLAY
24-A IC301-2 230mVp-p 50mV/200n sec.cm REC/PLAY	25-A IC301-3 4.2Vp-p 1V/5.0m sec.cm REC/PLAY	26-A IC301-5 500mVp-p 0.1V/20.0μ sec.cm REC	26-B IC301-5 1.8Vp-p 0.5V/20.0μ sec.cm PLAY	27-A IC301-6 560mVp-p 0.2V/20.0μ sec.cm REC	27-B IC301-6 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
28-A IC301-8 520mVp-p 0.1V/20.0μ sec.cm REC	29-A IC301-10 970mVp-p 0.2V/20.0μ sec.cm REC	29-B IC301-10 400mVp-p 0.1V/20.0μ sec.cm PLAY	30-B IC301-11 180mVp-p 0.1V/20.0μ sec.cm PLAY	31-A IC301-12 320mVp-p 0.1V/20.0μ sec.cm REC	32-A IC301-13 480mVp-p 0.1V/20.0μ sec.cm REC
33-A IC301-15 290mVp-p 0.1V/20.0μ sec.cm REC	33-B IC301-15 150mVp-p 50mV/20.0μ sec.cm PLAY	34-A IC301-17 75mVp-p 50mV/20.0μ sec.cm REC	34-B IC301-17 190mVp-p 50mV/20.0μ sec.cm PLAY	35-A IC301-29 720mVp-p 0.2V/200n sec.cm REC/PLAY	36-A IC301-30 960mVp-p 0.2V/200n sec.cm REC/PLAY
37-A IC301-32 920mVp-p 0.2V/200n sec.cm REC/PLAY	38-A IC301-34 4.3Vp-p 1V/20.0μ sec.cm REC/PLAY	39-A IC301-36 1.1Vp-p 0.5V/20.0μ sec.cm REC/PLAY	40-B IC301-42 860mVp-p 0.2V/20.0μ sec.cm PLAY	41-B IC301-45 110mVp-p 50mV/20.0μ sec.cm PLAY	

RT201
IH DELAY LINE LEVEL

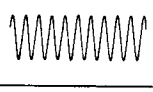
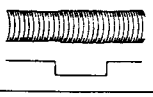
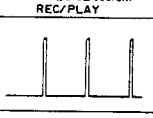
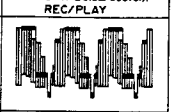
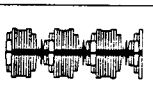
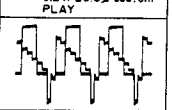
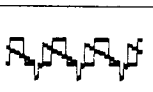
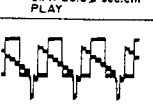
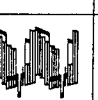
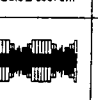
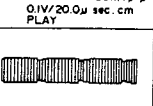
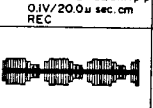
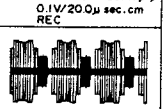
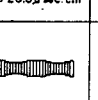
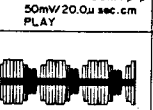
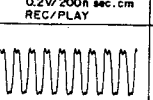
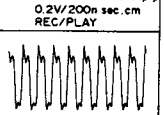
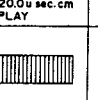




NOTE : MARK "Ⓩ" IS L

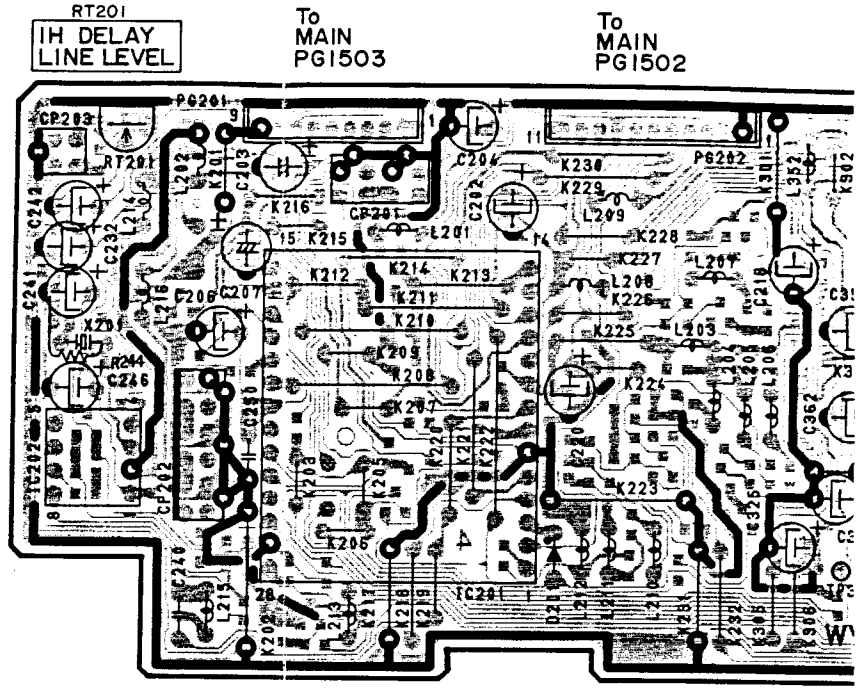
SCHEMATIC DIAGRAM	ITEM
AUDIO	5-5
FUNCTION SWITCH	5-6
CYL. MOTOR DRIVE	5-7
SENSOR	5-7
SERVO	5-8
SYS. CON./TIMER	5-10
REAR JACK	5-12
POWER SUPPLY	5-14
Y/CHROMA	5-18
PRE AMP	5-22
CAPSTAN MOTOR	5-22
RF CONVERTER (For UK)	5-23
RF CONVERTER (For CT)	5-23
RF CONVERTER (For VPS)	5-24
REMOTE CONTROL	5-25
TUNER (For UK)	5-26
TUNER (For CT, VPS)	5-27
IF (For UK)	5-28
IF (For CT, VPS)	5-29

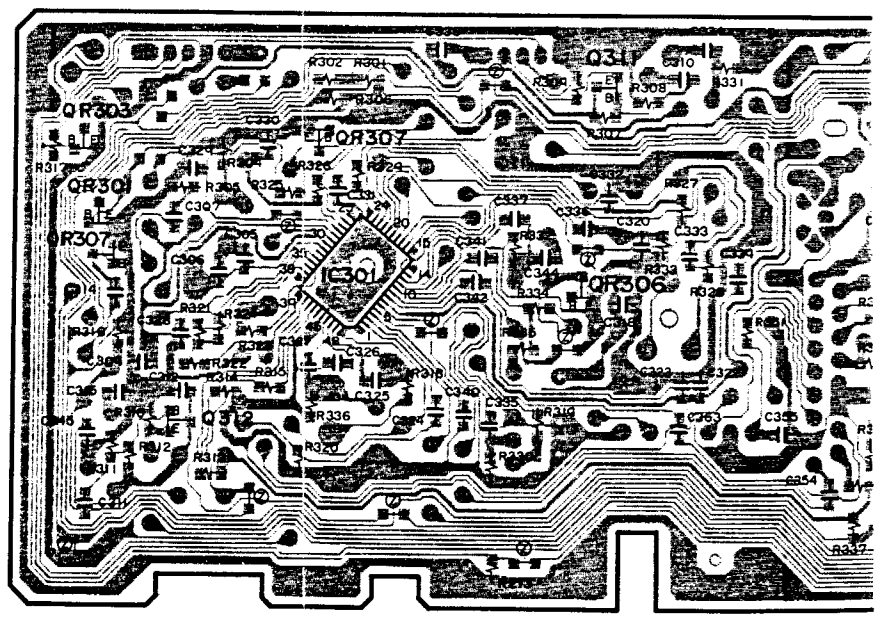
FORMS

303 870mVp-p V/200n sec.cm C/PLAY	4-A TP305 400mVp-p 0.1V/200n sec.cm REC/PLAY	5-A IC201-1 640mVp-p 0.2V/20.0μ sec.cm REC	6-B IC201-4 460mVp-p 0.1V/20.0μ sec.cm PLAY
			
01-8 440mVp-p /20.0μ sec.cm Y	10-B IC201-9 540mVp-p 0.2V/5.0m sec.cm PLAY	11-A IC201-10 4.4Vp-p 1V/20.0μ sec.cm REC/PLAY	12-A IC201-12 500mVp-p 0.1V/200μ sec.cm REC/PLAY
			
01-15 240mVp-p V/20.0μ sec.cm Y	16-B IC201-17 400mVp-p 0.1V/20.0μ sec.cm PLAY	17-A IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm REC	17-B IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
			
01-26 570mVp-p /20.0μ sec.cm /PLAY	21-B IC202-4 1.5Vp-p 0.5V/20.0μ sec.cm PLAY	22-B IC202-6 430mVp-p 0.1V/20.0μ sec.cm PLAY	23-A IC202-7 230mVp-p 50mV/100n sec.cm REC/PLAY
			
01-5 500mVp-p 20.0μ sec.cm	26-B IC301-5 1.8Vp-p 0.5V/20.0μ sec.cm PLAY	27-A IC301-6 560mVp-p 0.2V/20.0μ sec.cm REC	27-B IC301-6 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
			
01-10 400mVp-p 20.0μ sec.cm	30-B IC301-11 180mVp-p 0.1V/20.0μ sec.cm PLAY	31-A IC301-12 320mVp-p 0.1V/20.0μ sec.cm REC	32-A IC301-13 480mVp-p 0.1V/20.0μ sec.cm REC
			
01-17 75mVp-p V/20.0μ sec.cm	34-B IC301-17 190mVp-p 50mV/20.0μ sec.cm PLAY	35-A IC301-29 720mVp-p 0.2V/200n sec.cm REC/PLAY	36-A IC301-30 960mVp-p 0.2V/200n sec.cm REC/PLAY
			
01-36 1.1Vp-p 20.0μ sec.cm /PLAY	40-B IC301-42 860mVp-p 0.2V/20.0μ sec.cm PLAY	41-B IC301-45 110mVp-p 50mV/20.0μ sec.cm PLAY	
			

ITEM
5-5
5-6
5-7
5-7
5-8
5-10
5-12
5-14
5-18
5-22
5-22
5-23
5-23
5-24
5-25
5-26
5-27
5-28
5-29

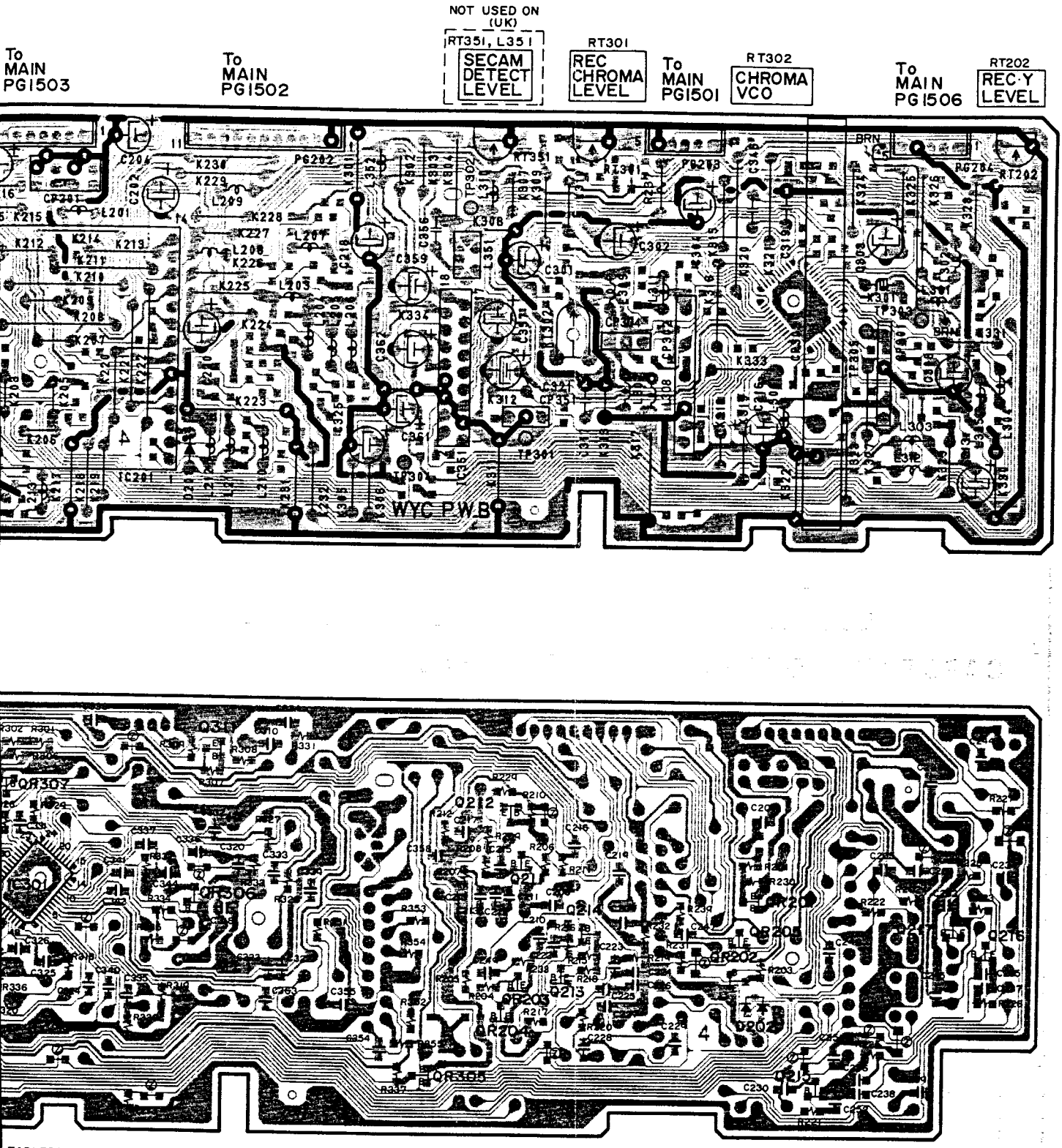
Y/CHROMA CIRCUIT BOARD DIAGRAM





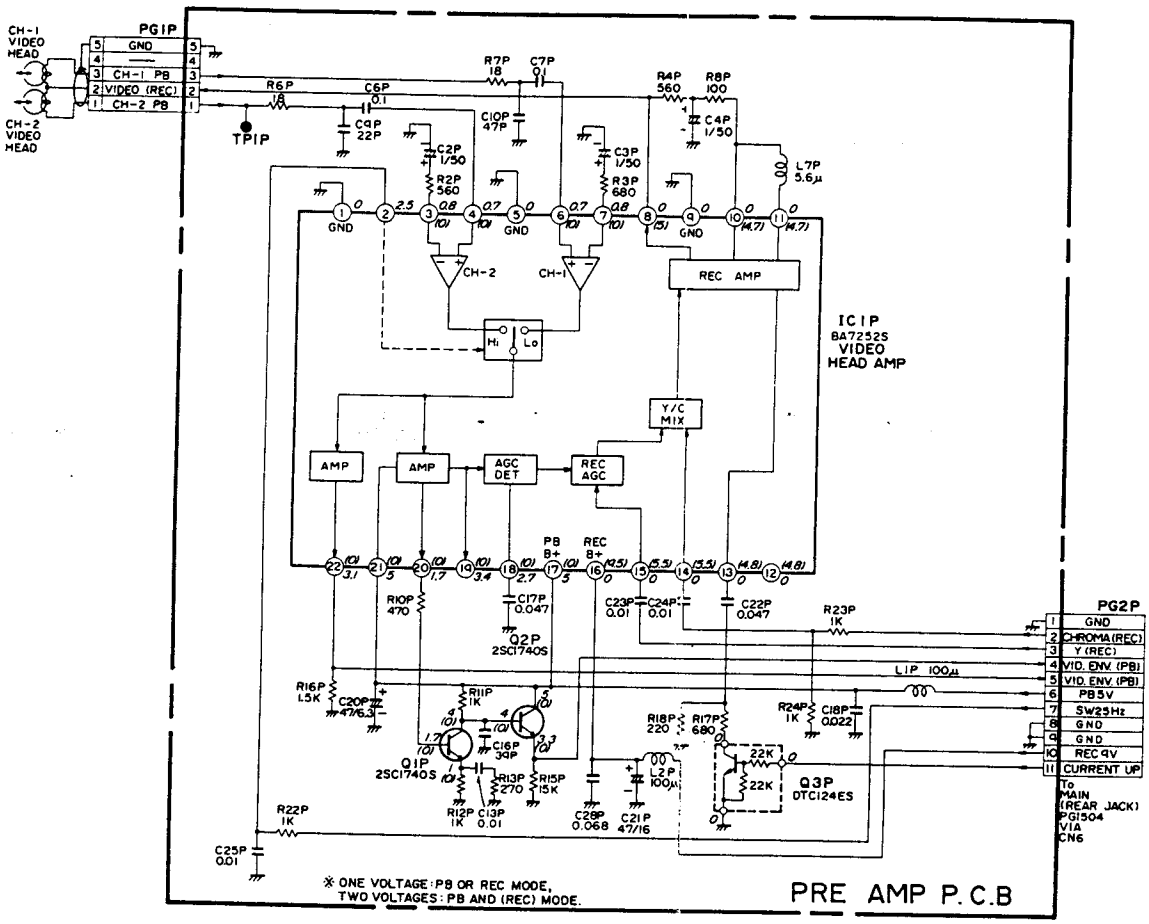
NOTE : MARK "Ⓩ" IS LEADLESS (CHIP) JUMPER.

CIRCUIT BOARD DIAGRAMS

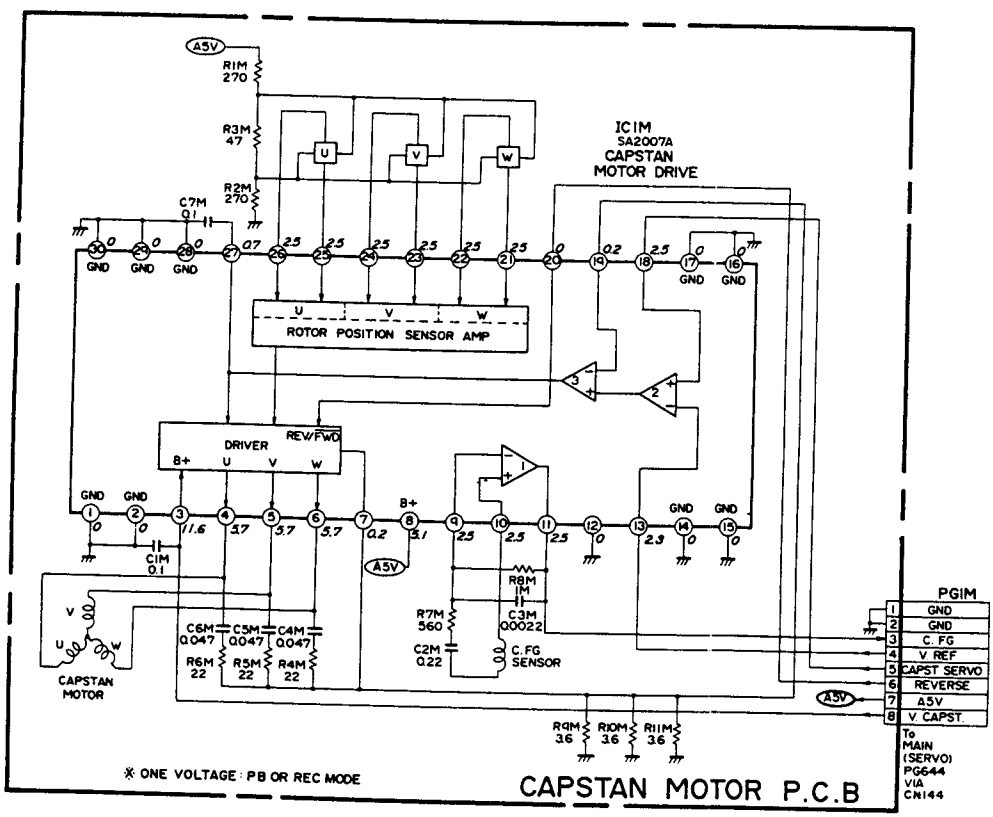


EADLESS (CHIP) JUMPER.

PRE AMP SCHEMATIC DIAGRAM

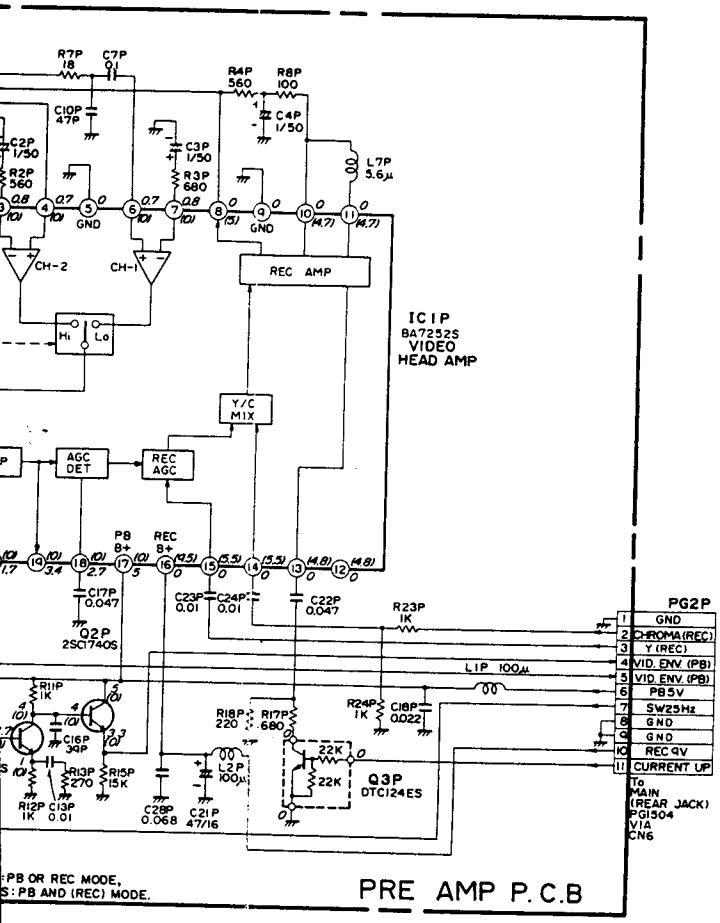


CAPSTAN MOTOR SCHEMATIC DIAGRAM

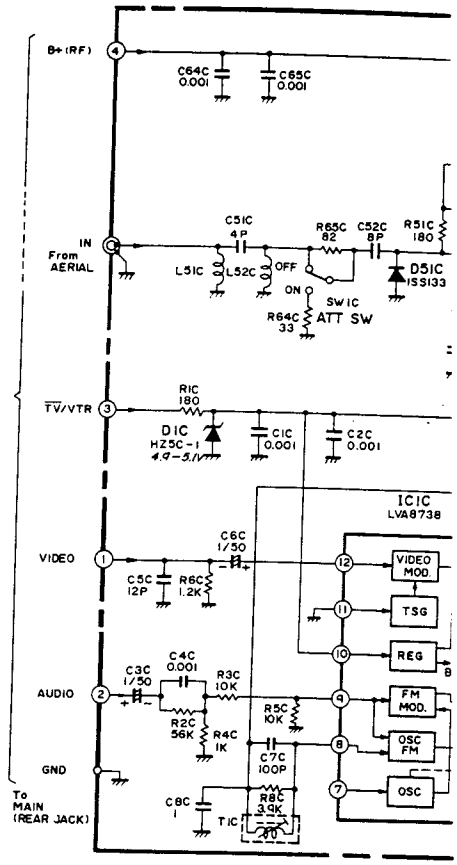


SCHEMATIC DIAGRAM	ITEM
AUDIO	5 – 5
FUNCTION SWITCH	5 – 6
CYL. MOTOR DRIVE	5 – 7
SENSOR	5 – 7
SERVO	5 – 8
SYS. CON./TIMER	5 – 10
REAR JACK	5 – 12
POWER SUPPLY	5 – 14
Y/CHROMA	5 – 18
PRE AMP	5 – 22
CAPSTAN MOTOR	5 – 22
RF CONVERTER (For UK)	5 – 23
RF CONVERTER (For CT)	5 – 23
RF CONVERTER (For VPS)	5 – 24
REMOTE CONTROL	5 – 25
TUNER (For UK)	5 – 26
TUNER (For CT, VPS)	5 – 27
IF (For UK)	5 – 28
IF (For CT, VPS)	5 – 29

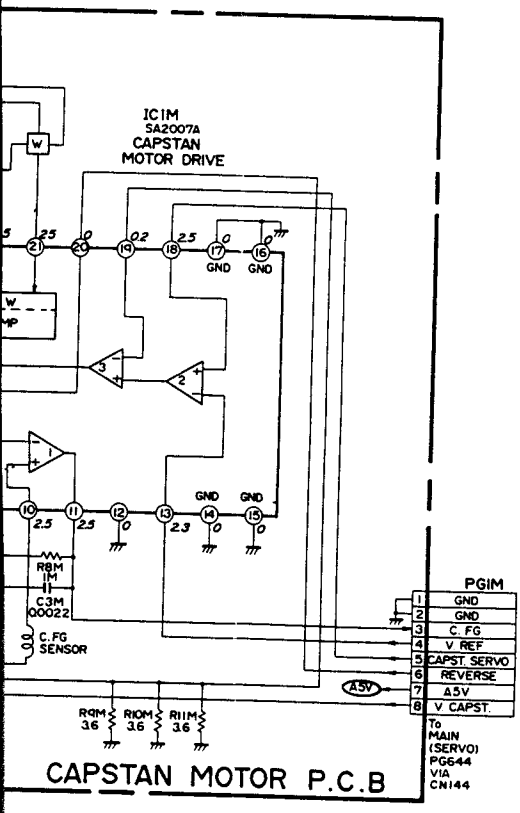
DIAGRAM



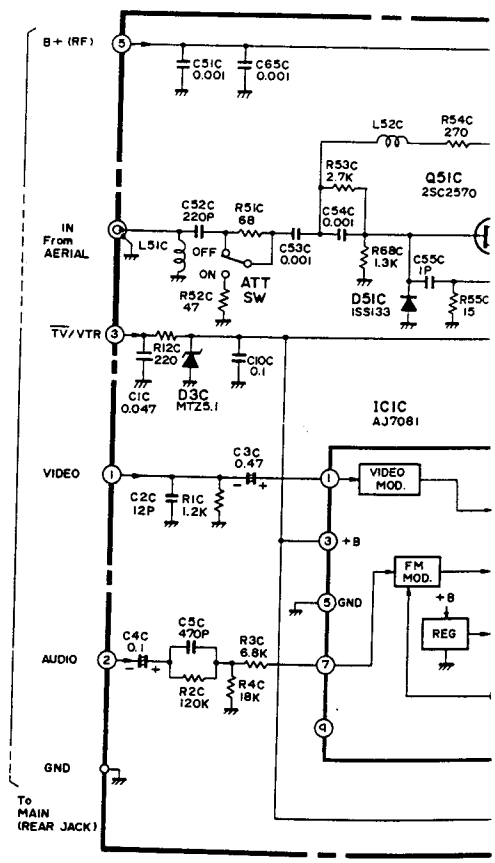
RF CONVERTER SCH



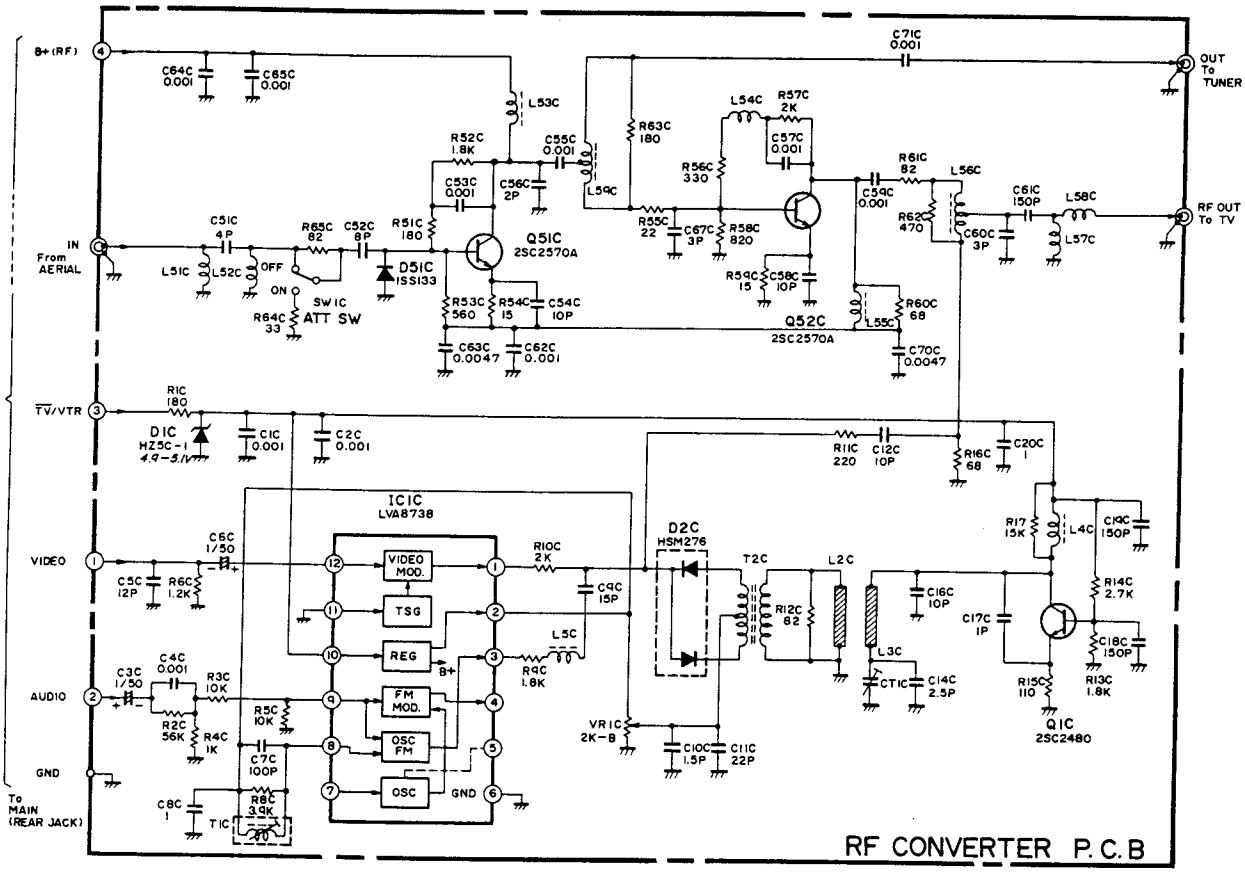
CHEMATIC DIAGRAM



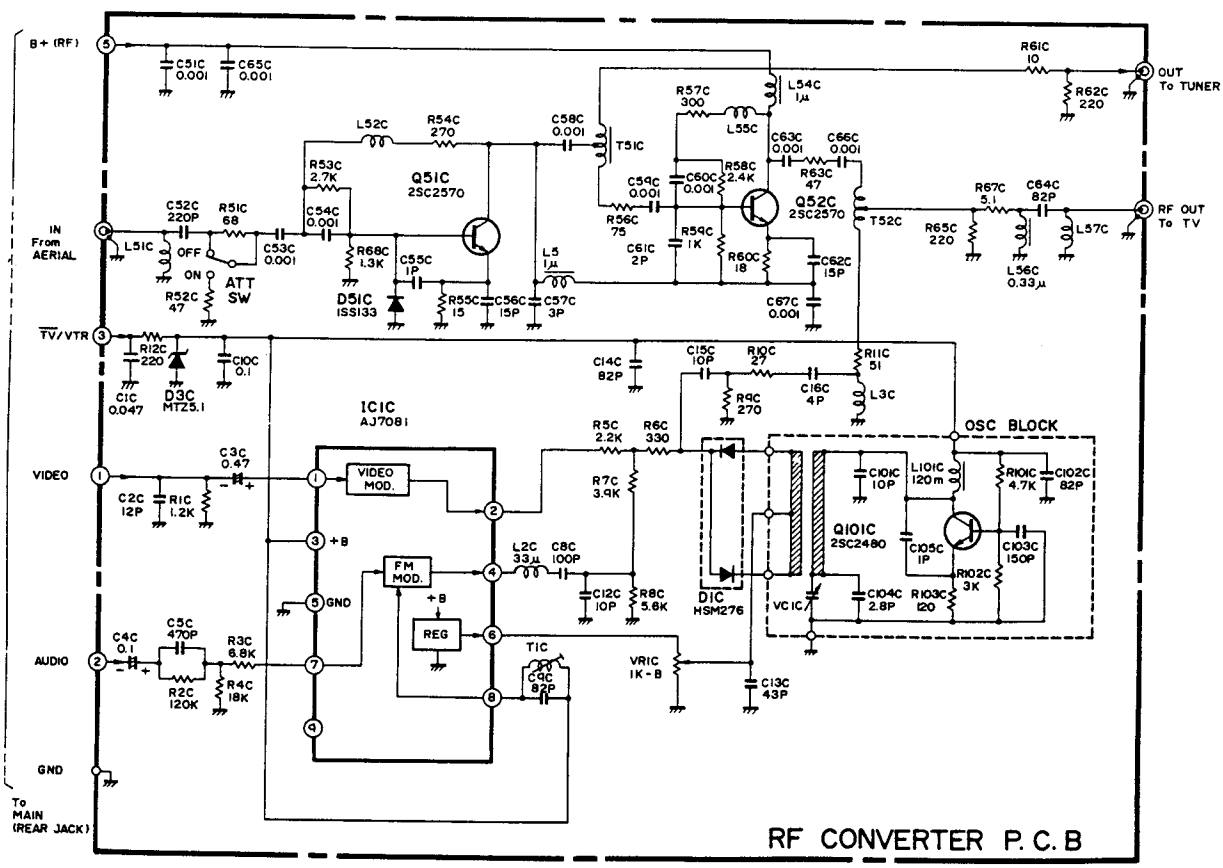
SCHEMATIC DIAGRAM	ITEM
AUDIO	5 – 5
FUNCTION SWITCH	5 – 6
CYL. MOTOR DRIVE	5 – 7
SENSOR	5 – 7
SERVO	5 – 8
SYS. CON. / TIMER	5 – 10
REAR JACK	5 – 12
POWER SUPPLY	5 – 14
Y/CHROMA	5 – 18
PRE AMP	5 – 22
CAPSTAN MOTOR	5 – 22
RF CONVERTER (For UK)	5 – 23
RF CONVERTER (For CT)	5 – 23
RF CONVERTER (For VPS)	5 – 24
REMOTE CONTROL	5 – 25
TUNER (For UK)	5 – 26
TUNER (For CT, VPS)	5 – 27
IF (For UK)	5 – 28
IF (For CT, VPS)	5 – 29



RF CONVERTER SCHEMATIC DIAGRAM (For UK)

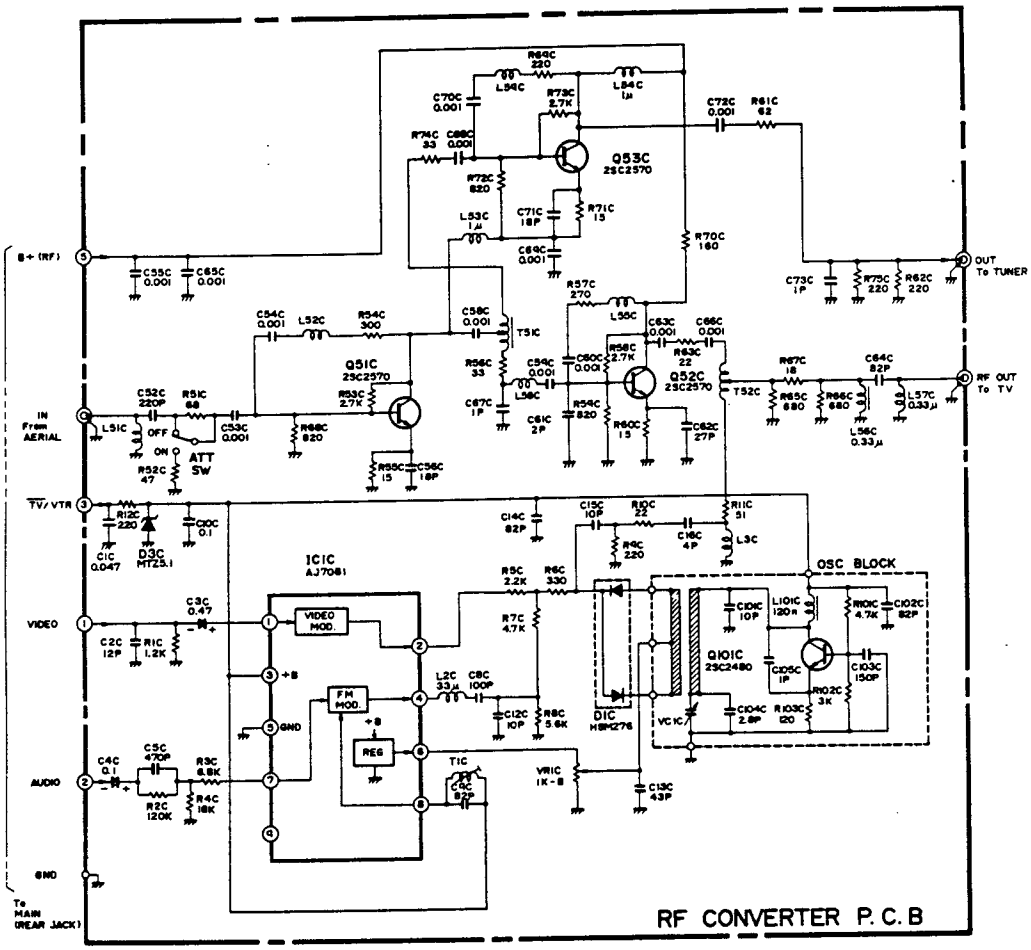


RF CONVERTER SCHEMATIC DIAGRAM (For CT)



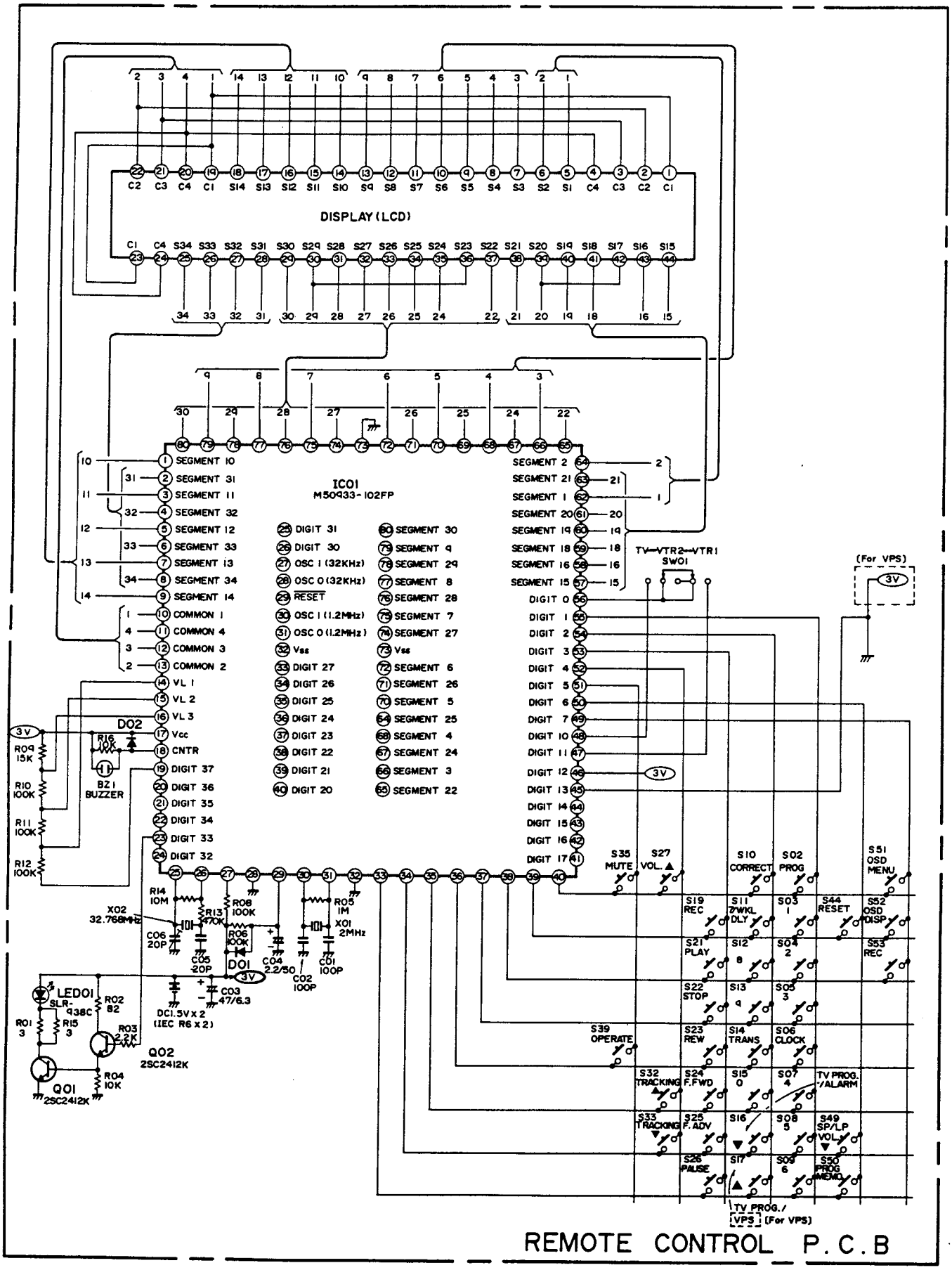
5 6 7 8

RF CONVERTER SCHEMATIC DIAGRAM (For VPS)



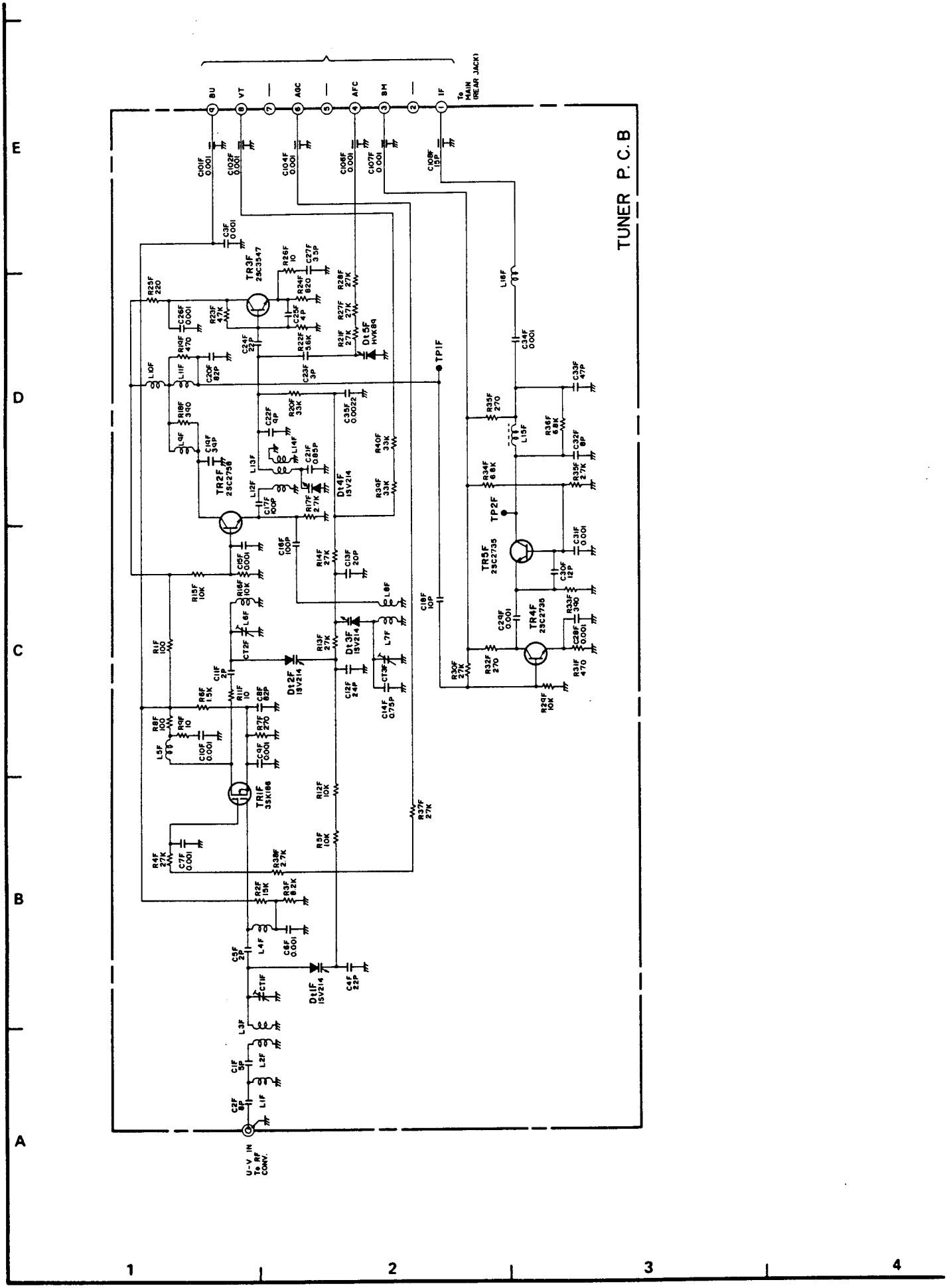
SCHEMATIC DIAGRAM	ITEM
AUDIO	5 – 5
FUNCTION SWITCH	5 – 6
CYL. MOTOR DRIVE	5 – 7
SENSOR	5 – 7
SERVO	5 – 8
SYS. CON./TIMER	5 – 10
REAR JACK	5 – 12
POWER SUPPLY	5 – 14
Y/CHROMA	5 – 18
PRE AMP	5 – 22
CAPSTAN MOTOR	5 – 22
RF CONVERTER (For UK)	5 – 23
RF CONVERTER (For CT)	5 – 23
RF CONVERTER (For VPS)	5 – 24
REMOTE CONTROL	5 – 25
TUNER (For UK)	5 – 26
TUNER (For CT, VPS)	5 – 27
IF (For UK)	5 – 28
IF (For CT, VPS)	5 – 29

REMOTE CONTROL SCHEMATIC DIAGRAM

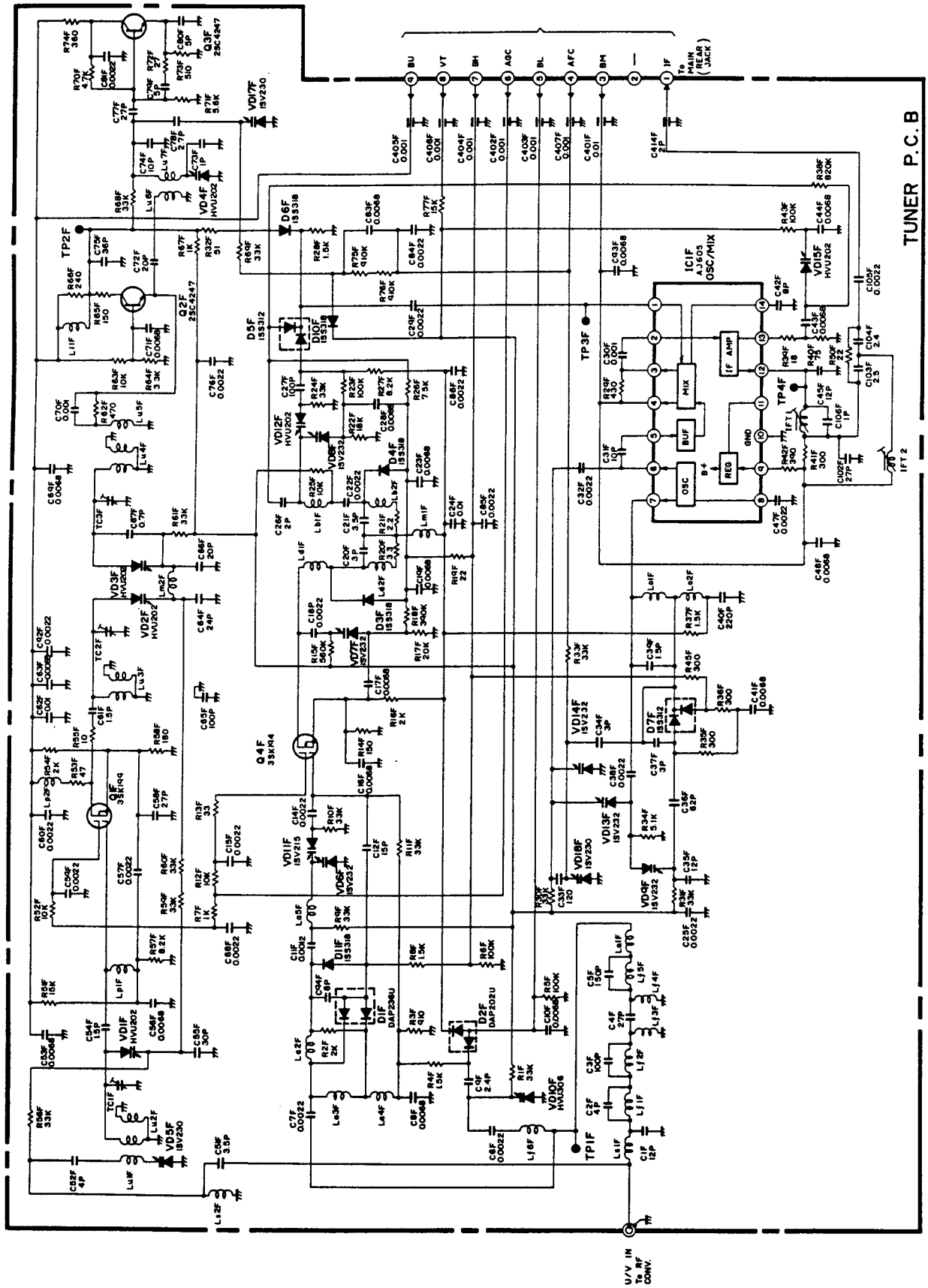


REMOTE CONTROL P.C.B

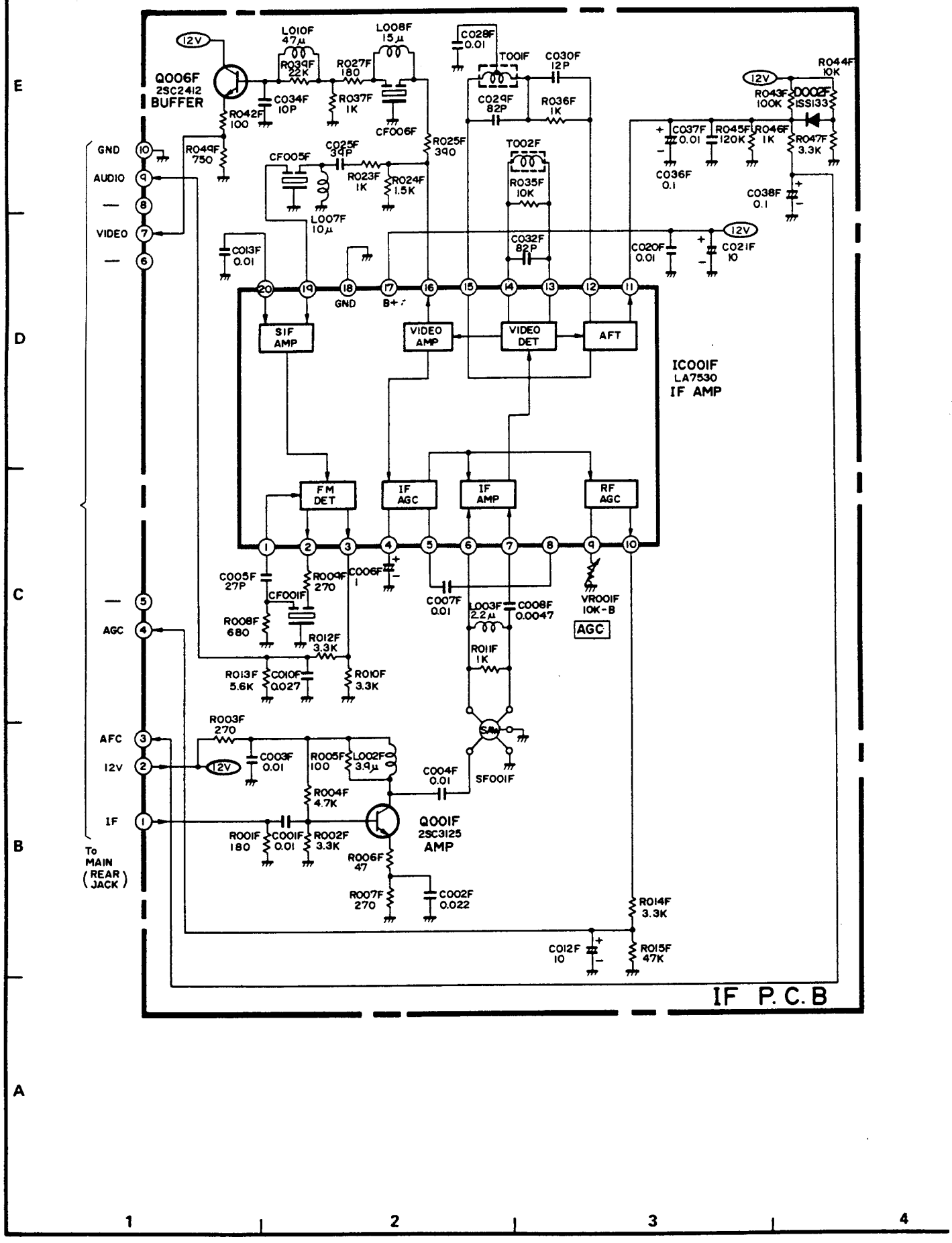
TUNER SCHEMATIC DIAGRAM (For UK)



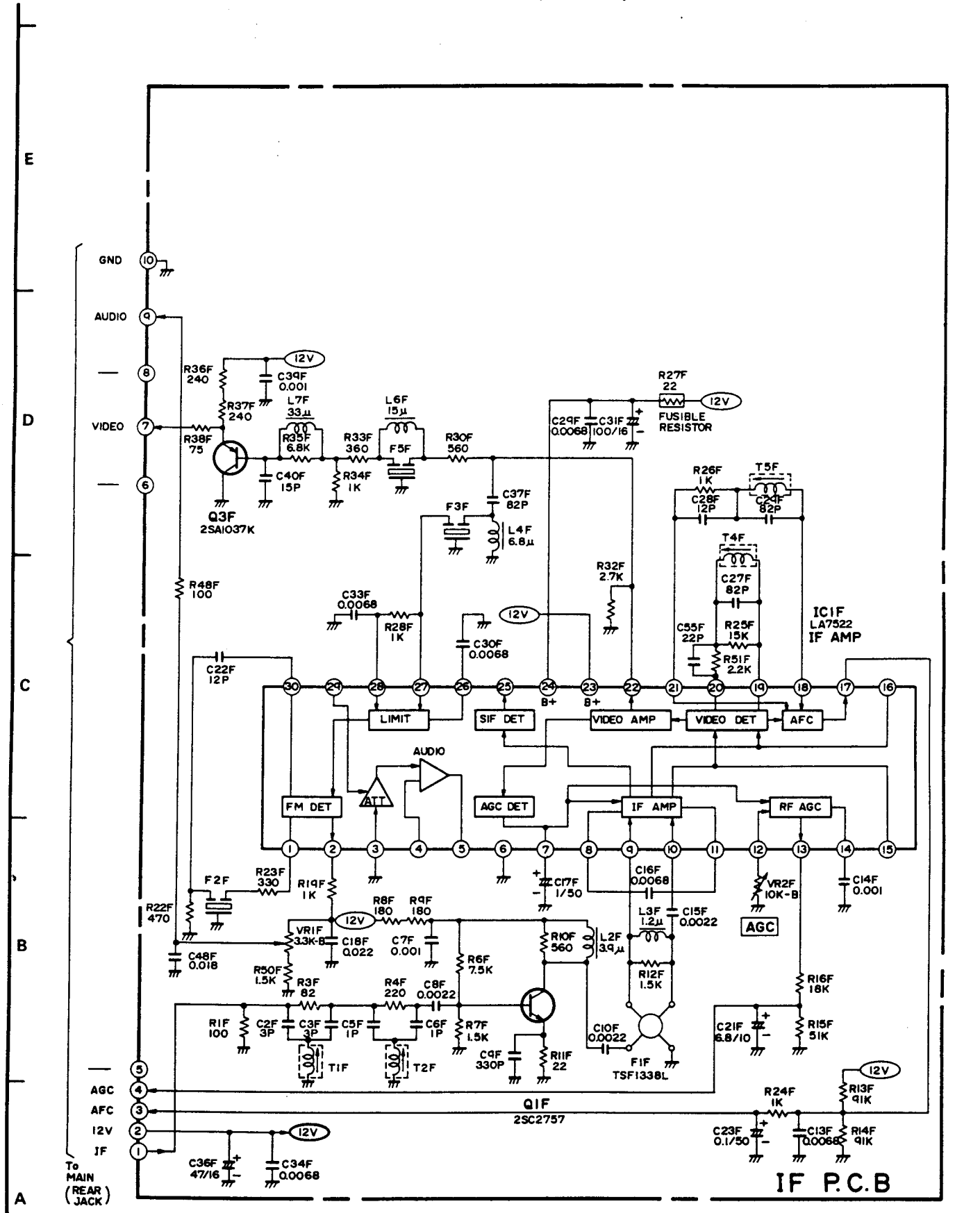
TUNER SCHEMATIC DIAGRAM (For CT, VPS)



IF SCHEMATIC DIAGRAM (For UK)



IF SCHEMATIC DIAGRAM (For CT, VPS)



REPLACEMENT PARTS LIST
ELECTRICAL PARTS LIST

SYMBOL—NO	P—NO	DESCRIPTION
		CAPACITORS
C 201	0201029	CERAMIC CHIP 68PF+-5% 50V
C 205	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 208	0201023	CERAMIC CHIP 18PF+-5% 50V
C 209	0201024	CERAMIC CHIP 27PF+-5% 50V
C 211	0201028	CERAMIC CHIP 56PF+-5% 50V
C 212	0201012	CERAMIC CHIP 2PF+-0.25% 50V
C 213	0201028	CERAMIC CHIP 56PF+-5% 50V
C 215	0201028	CERAMIC CHIP 56PF+-5% 50V
C 216	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 217	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 219	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 222	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 223	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 224	0201001	CERAMIC CHIP 22PF+-5% 50V
C 225	0201017	CERAMIC CHIP 7PF+-0.5% 50V
C 226	0201001	CERAMIC CHIP 22PF+-5% 50V
C 227	0201036	CERAMIC CHIP 270PF+-5% 50V
C 228	0201028	CERAMIC CHIP 56PF+-5% 50V
C 229	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 230	0201023	CERAMIC CHIP 18PF+-5% 50V
C 231	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 233	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 234	0201024	CERAMIC CHIP 27PF+-5% 50V
C 235	0201031	CERAMIC CHIP 100PF+-5% 50V
C 236	0201029	CERAMIC CHIP 68PF+-5% 50V
C 237	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 238	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 239	0201024	CERAMIC CHIP 27PF+-5% 50V
C 244	0201001	CERAMIC CHIP 22PF+-5% 50V
C 245	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 247	0201026	CERAMIC CHIP 39PF+-5% 50V
C 248	0201039	CERAMIC CHIP 470PF+-5% 50V
C 251	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 252	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 305	0201090	CERAMIC CHIP 15PF+-5% 50V
C 306	0201080	CERAMIC CHIP 1PF+-0.25% 50V
C 307	0201054	CERAMIC CHIP 1000PF+-10% 50V
C 309	0201072	CERAMIC CHIP 0.047UF+80-20% 25V
C 310	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 311	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 312	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 314	0201030	CERAMIC CHIP 82PF+-5% 50V
C 315	0201042	CERAMIC CHIP 820PF+-5% 50V
C 318	0201039	CERAMIC CHIP 470PF+-5% 50V
C 320	0201030	CERAMIC CHIP 82PF+-5% 50V
C 322	0201072	CERAMIC CHIP 0.047UF+80-20% 25V
C 323	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 324	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 325	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 326	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 327	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 328	0201031	CERAMIC CHIP 100PF+-5% 50V
C 329	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 330	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 331	0201036	CERAMIC CHIP 270PF+-5% 50V
C 332	0201010	CERAMIC CHIP 0.022UF+-20% 25V
C 333	0201039	CERAMIC CHIP 470PF+-5% 50V
C 334	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 335	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 336	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 337	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 338	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 339	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 340	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 341	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 342	0201007	CERAMIC CHIP 0.01UF+-20% 50V
C 344	0201033	CERAMIC CHIP 150PF+-5% 50V
C 345	0201022	CERAMIC CHIP 15PF+-5% 50V
C 412	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 419	0204271	POLYESTER FILM 8200PF+-5% 100V
C 420	0890026	CERAMIC DISC 220PF+-10% 50V
C 614	0890008	CERAMIC DISC 10PF+-5% 50V
C 618	0890035	CERAMIC DISC 1000PF 50V
C 619	0890045	CERAMIC DISC 0.047UF+80-20% 50V
C 621	0890022	CERAMIC DISC 100PF+-10% 50V
C 624	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 632	0890045	CERAMIC DISC 0.047UF+80-20% 50V
C 753	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 755	0890046	CERAMIC DISC 0.1UF+-20% 16V
C 757	0890024	CERAMIC DISC 150PF+-10% 50V
C 758	0890024	CERAMIC DISC 150PF+-10% 50V
C 759	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 761	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 762	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 763	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 764	0890037	CERAMIC DISC 2200PF+-20% 16V
C 765	0890035	CERAMIC DISC 1000PF 50V
C 769	0890118	CERAMIC DISC 22PF+-5% 50V
C 770	0890117	CERAMIC DISC 18PF+-5% 50V
C 772	0890043	CERAMIC DISC 0.01UF+-20% 16V
C 856	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 857	0256787	ELECTROLYTIC 4700UF 25V
C 859	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C 861	0256861	ELECTROLYTIC 2200UH 16V
C1402	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1404	0208444	CERAMIC DISC 15PF+-5% 50V
C1405	0208444	CERAMIC DISC 15PF+-5% 50V
C1412	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1522	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1526	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1528	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1529	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1532	0890028	CERAMIC DISC 330PF+-5% 50V
C1533	0890018	CERAMIC DISC 56PF+-50% 50V
C1534	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1542	0890043	CERAMIC DISC 0.01UF+-20% 16V
C1543	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1551	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1553	0890044	CERAMIC DISC 0.022UF+80-20% 25V
C1560	0890015	CERAMIC DISC 33PF+-10% 50V
C1572	0890035	CERAMIC DISC 1000PF 50V
C1573	0890035	CERAMIC DISC 1000PF 50V
C1574	0890035	CERAMIC DISC 1000PF 50V
C1575	0890035	CERAMIC DISC 1000PF 50V
C1576	0890035	CERAMIC DISC 1000PF 50V
C1654	0890045	CERAMIC DISC 0.047UF+80-20% 50V
		RESISTORS
R 201	0103842	CHIP RESISTOR 820 OHM+-5% 0.1W
R 202	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 203	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 204	0103830	CHIP RESISTOR 82OHM+-5% 0.1W
R 205	0103827	CHIP RESISTOR 47 OHM+-5% 0.1W
R 206	0103839	CHIP RESISTOR 470OHM+-5% 0.1W
R 207	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 208	0103838	CHIP RESISTOR 390 OHM+-5% 0.1W

SYMBOL–NO	P–NO	DESCRIPTION
R 209	0103839	CHIP RESISTOR 4700HM+-5% 0.1W
R 210	0103839	CHIP RESISTOR 4700HM+-5% 0.1W
R 211	0103848	CHIP RESISTOR 2.7KOHM+-5% 0.1W
R 212	0103848	CHIP RESISTOR 2.7KOHM+-5% 0.1W
R 215	0103847	CHIP RESISTOR 2.2KOHM+-5% 0.1W
R 216	0103839	CHIP RESISTOR 4700HM+-5% 0.1W
R 217	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 218	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 219	0103845	CHIP RESISTOR 1.5KOHM+-5% 0.1W
R 220	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 221	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 222	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 223	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 224	0103858	CHIP RESISTOR 18KOHM+-5% 0.1W
R 225	0103848	CHIP RESISTOR 2.7KOHM+-5% 0.1W
R 226	0103857	CHIP RESISTOR 15KOHM+-5% 0.1W
R 227	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 228	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 229	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 230	0103840	CHIP RESISTOR 560 OHM+-5% 0.1W
R 231	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 232	0103847	CHIP RESISTOR 2.2KOHM+-5% 0.1W
R 233	0103835	CHIP RESISTOR 220 OHM+-5% 0.1W
R 238	0103856	CHIP RESISTOR 12KOHM+-5% 0.1W
R 239	0103840	CHIP RESISTOR 560 OHM+-5% 0.1W
R 301	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 302	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 303	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 304	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 305	0103846	CHIP RESISTOR 1.8KOHM+-5% 0.1W
R 306	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 307	0103861	CHIP RESISTOR 33KOHM+-5% 0.1W
R 308	0103859	CHIP RESISTOR 22KOHM+-5% 0.1W
R 309	0103847	CHIP RESISTOR 2.2KOHM+-5% 0.1W
R 310	0103847	CHIP RESISTOR 2.2KOHM+-5% 0.1W
R 311	0103859	CHIP RESISTOR 22KOHM+-5% 0.1W
R 312	0103861	CHIP RESISTOR 33KOHM+-5% 0.1W
R 313	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 314	0103855	CHIP RESISTOR 10KOHM+-5% 0.1W
R 315	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 317	0103863	CHIP RESISTOR 47KOHM+-5% 0.1W
R 318	0103836	CHIP RESISTOR 270 OHM+-5% 0.1W
R 319	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 320	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 321	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 322	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
R 323	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 324	0103864	CHIP RESISTOR 56KOHM+-5% 0.1W
R 325	0103850	CHIP RESISTOR 3.9KOHM+-5% 0.1W
R 326	0103857	CHIP RESISTOR 15KOHM+-5% 0.1W
R 327	0103850	CHIP RESISTOR 3.9KOHM+-5% 0.1W
R 328	0103862	CHIP RESISTOR 39KOHM+-5% 0.1W
R 329	0103857	CHIP RESISTOR 15KOHM+-5% 0.1W
R 330	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 331	0103846	CHIP RESISTOR 1.8KOHM+-5% 0.1W
R 332	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 333	0103849	CHIP RESISTOR 3.3KOHM+-5% 0.1W
R 334	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 335	0103843	CHIP RESISTOR 1KOHM+-5% 0.1W
R 336	0103844	CHIP RESISTOR 1.2KOHM+-5% 0.1W
R 337	0103851	CHIP RESISTOR 4.7KOHM+-5% 0.1W
⚠ R 851	0101724	RESISTOR 8.2 OHM 1/4W
RT 201	5006234	SEMI VARIABLE 1KOHM
RT 202	5006235	SEMI VARIABLE 2.2KOHM
RT 301	5006236	SEMI VARIABLE 4.7KOHM
RT 302	5030008	SEMI VARIABLE 22KOHM
RT 401	5030011	SEMI VARIABLE 100KOHM
RT 601	5030013	SEMI VARIABLE 470KOHM
		SEMI-CONDUCTORS
D 141	5380933	LED GL-451
D 201	5339491	DIODE 1N4531
D 202	5328301	DIODE MA151WK (MT)
D 513	5332781	DIODE 1SS254
D 514	5332781	DIODE 1SS254
D 751	5339491	DIODE 1N4531
D 752	5339491	DIODE 1N4531
D 753	5339491	DIODE 1N4531
D 754	5339491	DIODE 1N4531
D 755	5339491	DIODE 1N4531
D 756	5339491	DIODE 1N4531
⚠ D 851	5333351	DIODE D3SBA10
⚠ D 852	5339231	DIODE 1SR35-100A
⚠ D 853	5339231	DIODE 1SR35-100A
⚠ D 854	5339231	DIODE 1SR35-100A
⚠ D 855	5339231	DIODE 1SR35-100A
D 856	5339171	DIODE 1SS130
D 857	5339171	DIODE 1SS130
D 858	5339491	DIODE 1N4531
D 859	5339491	DIODE 1N4531
D 861	5339231	DIODE 1SR35-100A
D1401	5339491	DIODE 1N4531
D1502	5339491	DIODE 1N4531
D1503	5339491	DIODE 1N4531
D1506	5339491	DIODE 1N4531
D1507	5339491	DIODE 1N4531
D1508	5339491	DIODE 1N4531
D1509	5339491	DIODE 1N4531
D1512	5332781	DIODE 1SS254
IC 141	5391282	IC DN6851
IC 201	1372132	IC HT7207C
IC 202	5362263	IC MSM6965R
IC 301	1351511	IC M52057FP
IC 401	1341472	IC LA7297
IC 601	1360391	IC HD49747N
IC 602	5367221	IC BA6993
IC 751	1355151	IC CXP50116-116Q
IC 753	5300795	IC XRA6209U4
IC 754	1340002	IC S-8053ALB
IC 755	5301561	IC M6M80021P
IC 851	5364309	IC RC78M05E
IC 852	1342612	IC RC78M12FA
IC1401	1361441	IC UPD6450
IC1501	1341331	IC LA7938
IC1502	5366981	IC M5201L
IC1503	1342031	IC NJM2248S
IC1651	1360071	IC BA6459P1
Q 141	5324661	TRANSISTOR PT-483F1
Q 142	5324661	TRANSISTOR PT-483F1
Q 211	5326273	TRANSISTOR MMBC1623L56
Q 212	5326273	TRANSISTOR MMBC1623L56
Q 213	5326273	TRANSISTOR MMBC1623L56
Q 214	5326273	TRANSISTOR MMBC1623L56
Q 215	5326273	TRANSISTOR MMBC1623L56
Q 216	5326273	TRANSISTOR MMBC1623L56
Q 217	5326273	TRANSISTOR MMBC1623L56
Q 311	5326273	TRANSISTOR MMBC1623L56
Q 312	5326273	TRANSISTOR MMBC1623L56
Q 401	5327101	TRANSISTOR 2SC3553BC

SYMBOL–NO	P–NO	DESCRIPTION
Q 601	1321341	TRANSISTOR 2SD1765
Q 851	5327031	TRANSISTOR 2SA673C
Q 854	1321341	TRANSISTOR 2SD1765
Q 855	1321341	TRANSISTOR 2SD1765
Q1401	5327241	TRANSISTOR KSC945C (G)
Q1402	5327241	TRANSISTOR KSC945C (G)
Q1404	5327241	TRANSISTOR KSC945C (G)
Q1407	5327021	TRANSISTOR 2SA844CD
Q1501	5327031	TRANSISTOR 2SA673C
Q1509	5327001	TRANSISTOR 2SC458CD
Q1510	5327241	TRANSISTOR KSC945C (G)
Q1524	5327031	TRANSISTOR 2SA673C
Q1525	5327031	TRANSISTOR 2SA673C
Q1552	5327031	TRANSISTOR 2SA673C
QR 201	5328793	TRANSISTOR DTC144K-26
QR 202	5328793	TRANSISTOR DTC144K-26
QR 203	5328791	TRANSISTOR DTC124K(25)
QR 204	5328791	TRANSISTOR DTC124K(25)
QR 205	5328791	TRANSISTOR DTC124K(25)
QR 301	5328793	TRANSISTOR DTC144K-26
QR 302	5328793	TRANSISTOR DTC144K-26
QR 303	5328793	TRANSISTOR DTC144K-26
QR 304	5328791	TRANSISTOR DTC124K(25)
QR 305	5328793	TRANSISTOR DTC144K-26
QR 306	5328791	TRANSISTOR DTC124K(25)
QR 307	5328793	TRANSISTOR DTC144K-26
QR 601	5327073	TRANSISTOR DTC144ES
QR 602	5327074	TRANSISTOR DTA144ES
QR 751	5327073	TRANSISTOR DTC144ES
QR 752	5327073	TRANSISTOR DTC144ES
QR 753	5327073	TRANSISTOR DTC144ES
QR 755	5327073	TRANSISTOR DTC144ES
QR 853	5327073	TRANSISTOR DTC144ES
QR1403	5327073	TRANSISTOR DTC144ES
QR1502	5327073	TRANSISTOR DTC144ES
QR1520	5327082	TRANSISTOR RT1N441S
QR1522	5327073	TRANSISTOR DTC144ES
QR1523	5327073	TRANSISTOR DTC144ES
QR1524	5327074	TRANSISTOR DTA144ES
QR1525	5327073	TRANSISTOR DTC144ES
QR1526	5327073	TRANSISTOR DTC144ES
ZD 601	5339263	ZENER DIODE HZS7-A1
ZD 602	5339263	ZENER DIODE HZS7-A1
ZD 603	5339263	ZENER DIODE HZS7-A1
ZD 604	5339274	ZENER DIODE HZS15-3
ZD 751	5339263	ZENER DIODE HZS7-A1
ZD 752	5339262	ZENER DIODE HZS6-C2
ZD 753	5339271	ZENER DIODE HZS9A2
ZD 754	5339274	ZENER DIODE HZS15
ZD 851	5339256	ZENER DIODE HZS30
ZD 853	5339277	ZENER DIODE HZS6A2
ZD 854	5339266	ZENER DIODE HZS5C-1
ZD 855	5339259	ZENER DIODE HZS9-C3
ZD 856	5339291	ZENER DIODE HZS3B1
ZD1501	5339258	ZENER DIODE HZS7-C
ZD1502	5350611	IC UPC574J
		TRANSFORMERS
T 401	5262545	OSCILLATOR,BIAS
⚠ T 851	5214264	TRANSFORMER,POWER
		COILS
L 201	5159149	CHOKE COIL 47UH
L 202	5159083	CHOKE COIL 270UH+-10%
L 203	5159145	CHOKE COIL 22UH
L 204	5159151	CHOKE COIL 56UH
L 205	5159144	CHOKE COIL 18UH
L 206	5159144	CHOKE COIL 18UH
L 207	5159147	CHOKE COIL 33UH
L 208	5159077	CHOKE COIL 100UH+-10%
L 209	5159077	CHOKE COIL 100UH+-10%
L 210	5159145	CHOKE COIL 22UH
L 211	5159156	CHOKE COIL 150UH
L 212	5159153	CHOKE COIL 82UH
L 213	5159153	CHOKE COIL 82UH
L 214	5159077	CHOKE COIL 100UH+-10%
L 215	5159141	CHOKE COIL 10UH
L 216	5159077	CHOKE COIL 100UH+-10%
L 301	5159149	CHOKE COIL 47UH
L 302	5159077	CHOKE COIL 100UH+-10%
L 303	5159077	CHOKE COIL 100UH+-10%
L 304	5159148	CHOKE COIL 39UH
L 305	5159154	CHOKE COIL 100UH
L 306	5159143	CHOKE COIL 15UH
L 307	5159088	CHOKE COIL 680UH
L 308	5152344	CHOKE COIL 330UH
L 309	5159084	CHOKE COIL 330UH
L 310	5159077	CHOKE COIL 100UH+-10%
L 311	5121175	CHOKE COIL 22UH
L 312	5159149	CHOKE COIL 47UH
L 401	5159113	COIL,CHOKE 8.2MH
L 402	5159081	CHOKE COIL 180UH+-10%
L1401	5159077	CHOKE COIL 100UH+-10%
L1402	5159077	CHOKE COIL 100UH+-10%
L1504	5159077	CHOKE COIL 100UH+-10%
L1505	5159077	CHOKE COIL 100UH+-10%
L1506	5159077	CHOKE COIL 100UH+-10%
		CRYSTALS
X 201	5778181	OSCILLATOR
X 301	5784551	OSCILLATOR
X 751	5781582	CRYSTAL
X 752	5783001	CRYSTAL
X1401	5784511	CRYSTAL 17.734MHZ
		MISCELLANEOUS
BL1401	5272373	LINE FILTER
BL1501	5272373	LINE FILTER
BL1502	5272373	LINE FILTER
CP 201	5163955	FILTER
CP 202	5163533	FILTER
CP 203	5163805	LC FILTER
CP 301	5163792	LC FILTER
CP 302	5165051	FILTER
CP 303	5785388	DELAY LINE
CP 304	5162642	DELAY LINE
CP1401	5163372	FILTER
DG 751	5315172	FLUORESCET INDICATORTUBE
⚠ F 851	5720174	FUSE 630MA
⚠ F 852	5721061	FUSE 1.6A
⚠ F 853	5720174	FUSE 630MA
J1502	5673901	JACK
S 141	5635321	SWITCH
S 142	5635331	SWITCH
S1751	5635061	SWITCH
S1752	5635061	SWITCH

SYMBOL–NO	P–NO	DESCRIPTION
S1753	5635061	SWITCH
S1754	5635061	SWITCH
S1755	5635061	SWITCH
S1756	5635061	SWITCH
S1759	5635113	SWITCH
IR1751	5317191	

SYMBOL–NO	P–NO	DESCRIPTION

MECHANICAL PARTS LIST

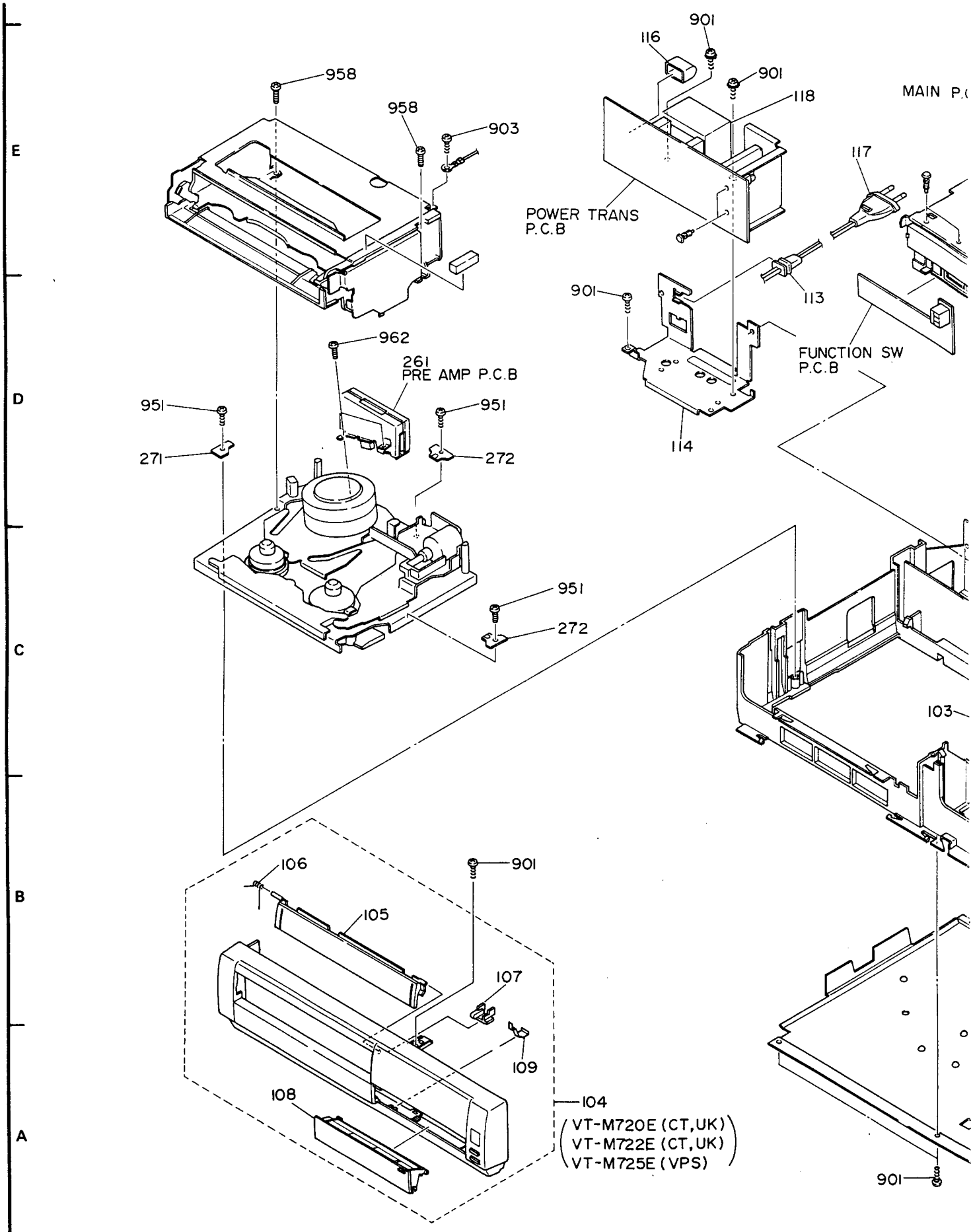
SYMBOL–NO	P–NO	DESCRIPTION
		FOR FINAL ASSEMBLY
101	6007291	COVER,TOP
102	6007301	COVER,BOTTOM
103	7741444	FELT (LEG)
104	6486683	PANEL,FRONT(FOR VT-M720E(UK))
104	6486682	PANEL,FRONT(FOR VT-M722E(UK))
105	6249631	DOOR,CASSETTE
106	6551851	SPRING,DOOR
107	6814701	STOPPER,DOOR
108	6486692	DOOR,BUTTON
109	6527732	SPRING
110	6528331	PLATE
111	6485981	PANEL,REAR
113	6794091	RUBBER BUSH
114	4891701	HOLDER
116	6407471	COVER,FUSE
⚠ 117	5850952	CORD,POWER
⚠ 118	5214264	TRANSFORMER,POWER
119	6810111	HOLDER
120	6714211	NYLON RIVET - 3MMD
121	5588751	TUNER IF BLOCK
122	5589371	CONVERTOR,RF
123	5885997	CORD
202	6915922	SCREW
203	7469871	BASE
204	5434061	HEAD
205	6304906	SPRING
206	6522752	SPRING
207	7785673	NUT
208	6820341	ARM
209	6555501	SPRING
210	6416121	SPRING
211	7789123	POLYSLIDER WASHER
212	6416131	REEL TABLE,TAKE UP
213	7789122	POLYSLIDER WASHER
214	6384352	ARM,PRESSURE ROLLER
215	6805041	SLIDER BLOCK
216	7412822	PLATE
217	7429651	GEAR,LOADING(L)
218	7429661	GEAR,LOADING(R)
219	6911551	GUIDE ROLLER BASE(IN)
220	6424261	ROLLER,GUIDE
221	6911572	GUIDE ROLLER BASE(OUT)
222	6897071	BASE
223	5445851	HEAD FULL ERASE
225	4508237	GUIDE,TAPE
226	6555431	SPRING
227	7413665	HOLDER-BAND
228	7412863	ARM
229	6555444	SPRING
230	6897265	BRACKET
231	6896752	ARM
232	6555061	SPRING
233	6897473	ARM,IMPEDANCE
235	7468853	BLOCK,LOADING
236	7398631	BRACKET
237	7412881	ARM
238	6976551	ARM
239	7412893	ARM
240	7412872	ARM
241	6897241	ARM
242	6551151	SPRING
243	6804792	BRAKE

SYMBOL–NO	P–NO	DESCRIPTION
244	6896895	HOLDER,MOTOR
245	6896852	ARM
246	6897251	ARM
247	6555483	SPRING
248	6897271	ARM
249	6897065	GEAR,MODE
250	6434861	WORM WHEEL
251	6555052	SPRING
252	7799012	WASHER
255	4508235	GUIDE
261	4130273	PWB ASSY PRE-AMP
271	7429631	BRACKET
272	7429641	BRACKET
301	5571741	MOTOR,CAPSTAN
302	6804831	CLUTCH BASE ASSY
303	6351555	BELT
304	6897095	ARM,FF/REW
305	6434852	RACK
402	6804982	BRACKET
403	6804962	BRACKET
404	6896971	WORM WHEEL ASSY
405	6435571	WORM
406	4508221	WORM SHAFT
407	6804992	BRACKET
408	6896632	ARM-SWITCH
409	6302474	SPRING
410	6897041	ARM-SWITCH
411	7412583	BRACKET-GEAR
412	7449177	HOLDER,CASSETTE
413	7449163	BASE,HOLDER
414	6896664	HOLDER,CASSETTE (R)
415	7428113	HOLDER,STAY
416	6820361	ARM
417	6897001	ARM
418	6556241	SPRING
419	6896673	HOLDER,CASSETTE (L)
420	7412944	ARM
421	6555772	SPRING
422	7412953	SPRING
423	6806531	HOLDER,FRONT
424	7580791	SHAFT ASSY
425	7412552	BRACKET,SIDE(L)
426	7794391	WASHER
427	6551551	SPRING
501	5436102	CYLINDR,UPPER
502	5436312	CYLINDER,LOWER(CY-Z2PV)
503	5792635	BRUSH,CYLINDER
901	8699410	SCREW(3X10)
902	7784428	SCREW (M3)
903	8699412	SCREW (3X12) BLACK
904	7785351	SCREW (4X14)
951	8691410	SCREW
952	8691308	BT SCREW-2.6MMDX8MM
953	8699408	SCREW
954	7781872	SCREW-3MMDX8MM
955	7773086	SCREW
956	8741414	SCREW (3X14)
957	8691412	SCREW (3X12)
958	8691408	SCREW (3X8)
959	8711406	SCREW - 3X6 PAN HEADSCREW
960	8741412	SCREW (B3X12)
961	7785941	SCREW
962	8711404	SCREW - 3X4 PAN HEADSCREW
963	7775581	SCREW(M3X14)
998	7784131	SCREW (3X8)

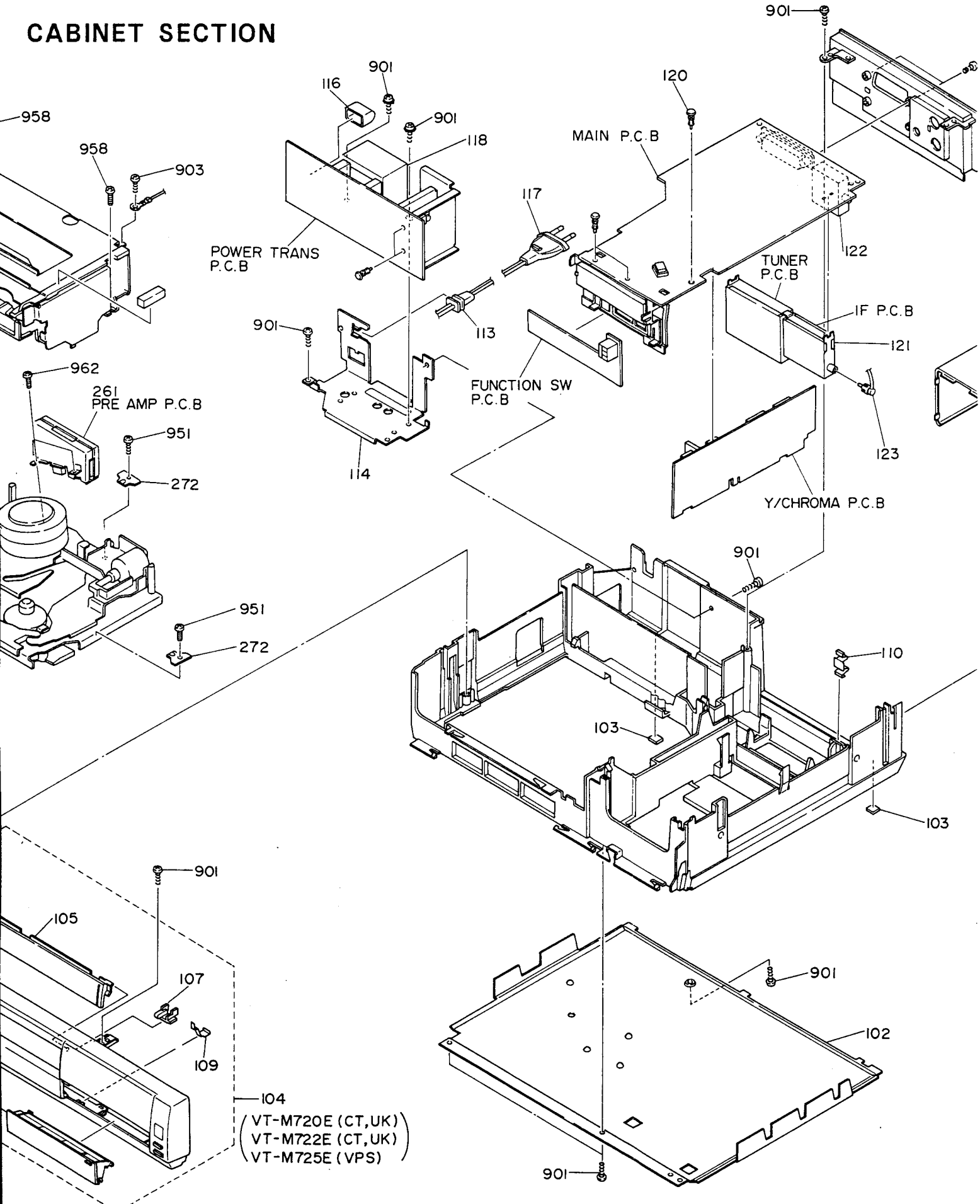
SYMBOL–NO	P–NO	DESCRIPTION
999	8711405	SCREW (3X5)
		FOR ACCESSORIES
	5858311	CONNECTION CODE
	5614753	REMOTE HAND SET
		FOR REMOTE CONTROLLER UNIT
1	5614061	COVER
2	5614844	CASE,UPPER
3	5614062	PLATE,CLEAR
4	5614063	CASE,BOTTOM
5	5614066	CASE,BATTERY

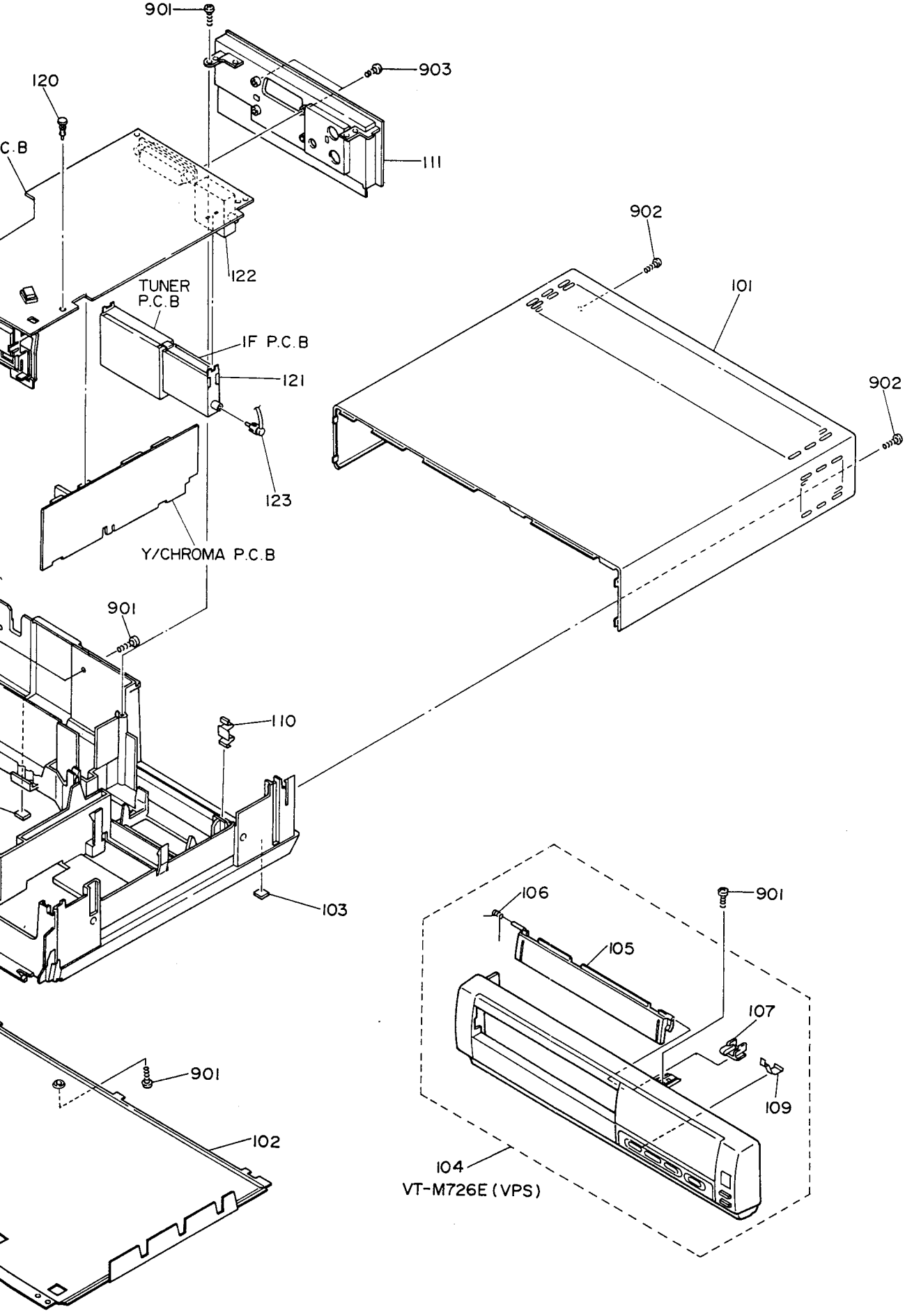
SYMBOL–NO	P–NO	DESCRIPTION

2. EXPLODED VIEWS CABINET SECTION

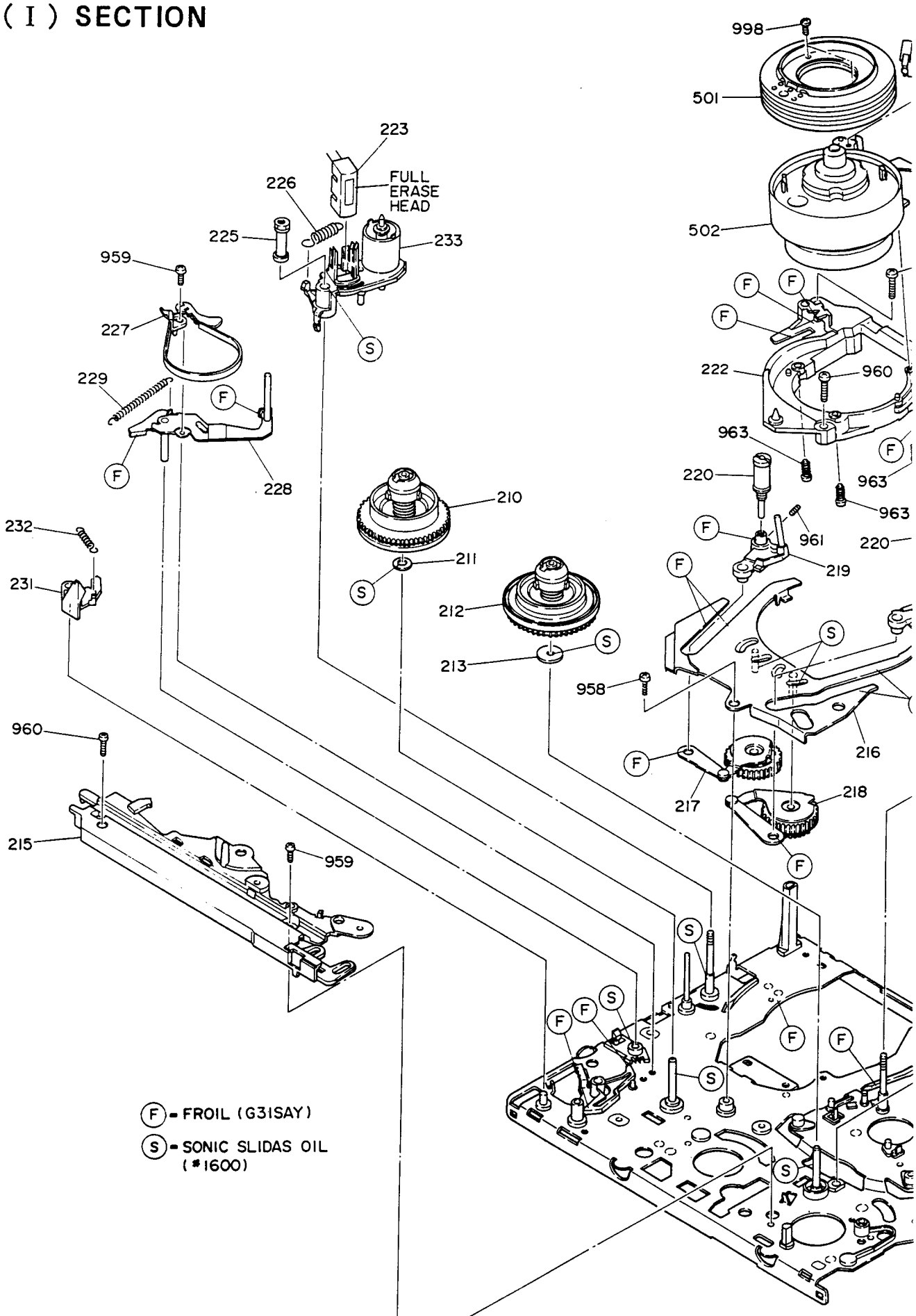


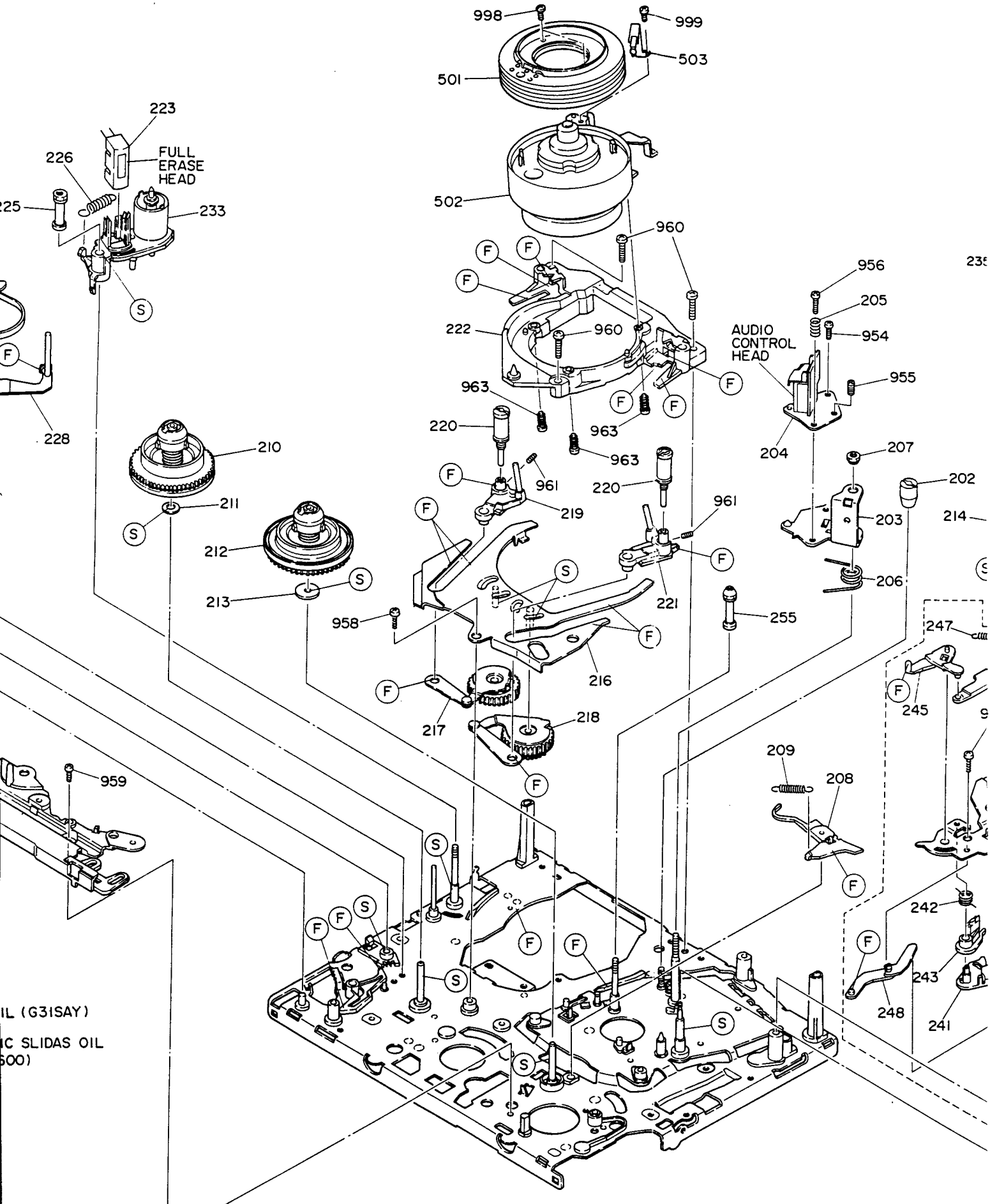
CABINET SECTION

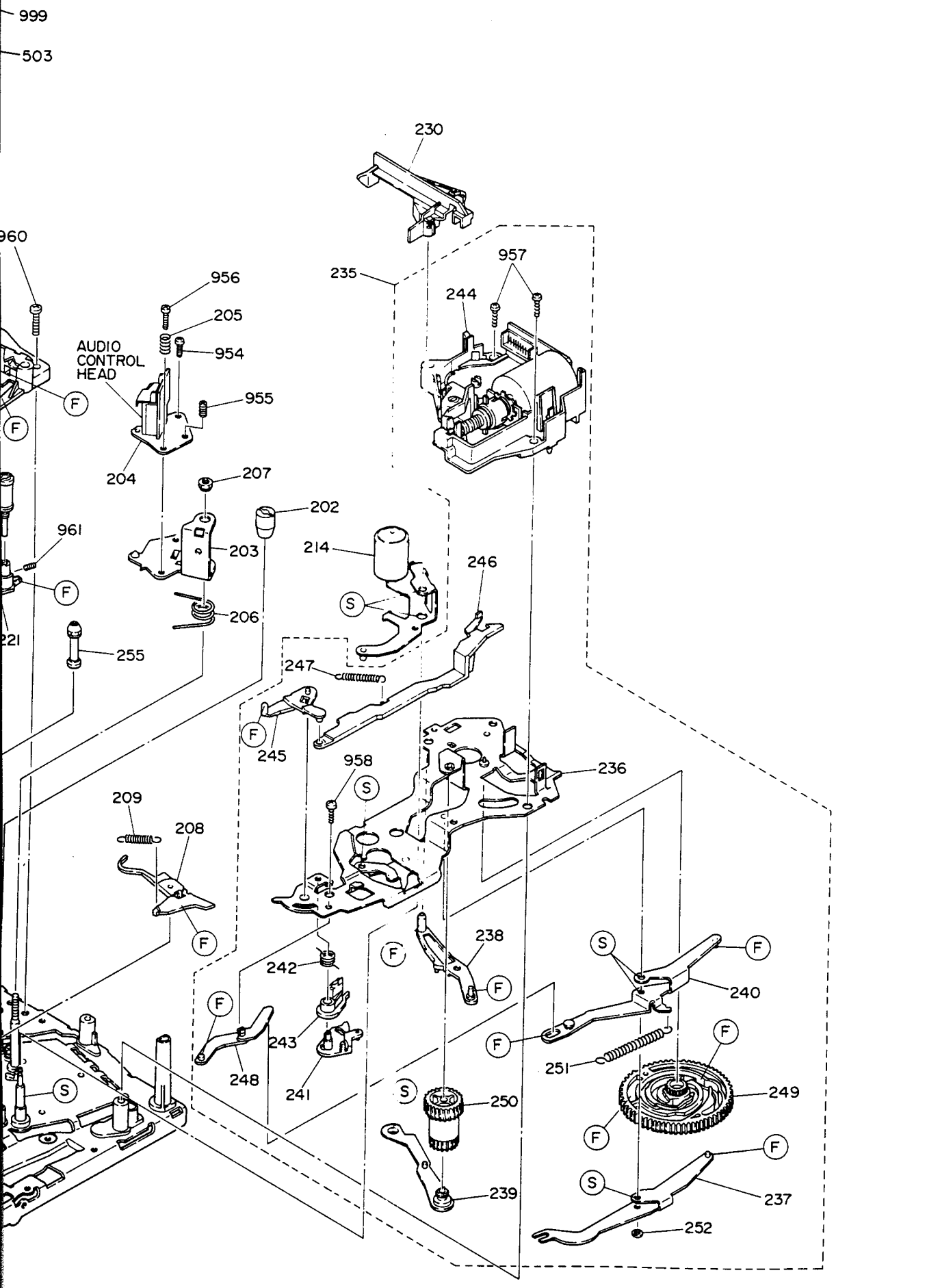



901
903
120
C.B
111
902
122
TUNER
P.C.B
101
IF P.C.B
121
902
123
Y/CHROMA P.C.B
901
110
103
106
901
105
107
109
901
102
104
VT-M726E (VPS)

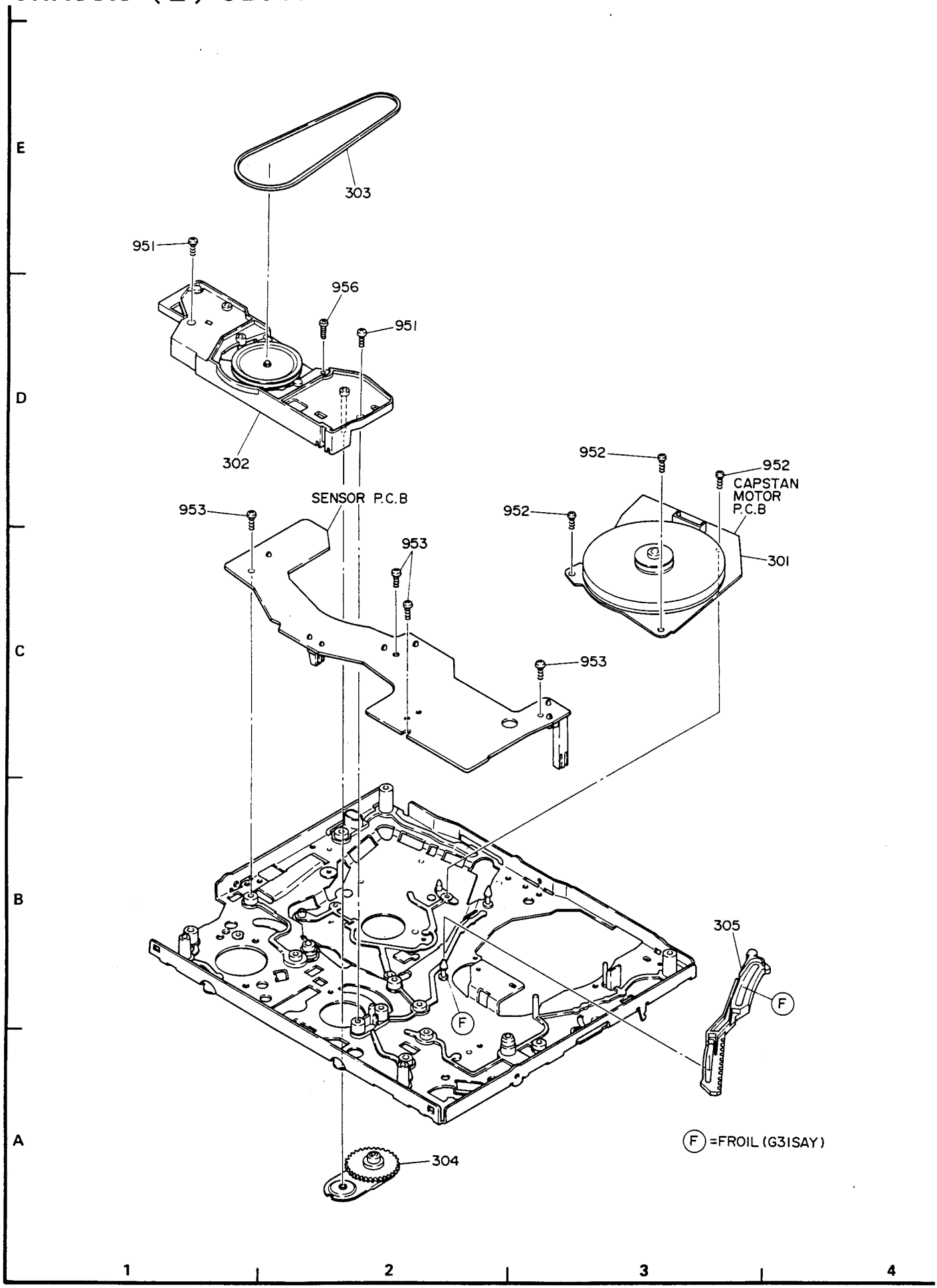
CHASSIS (I) SECTION



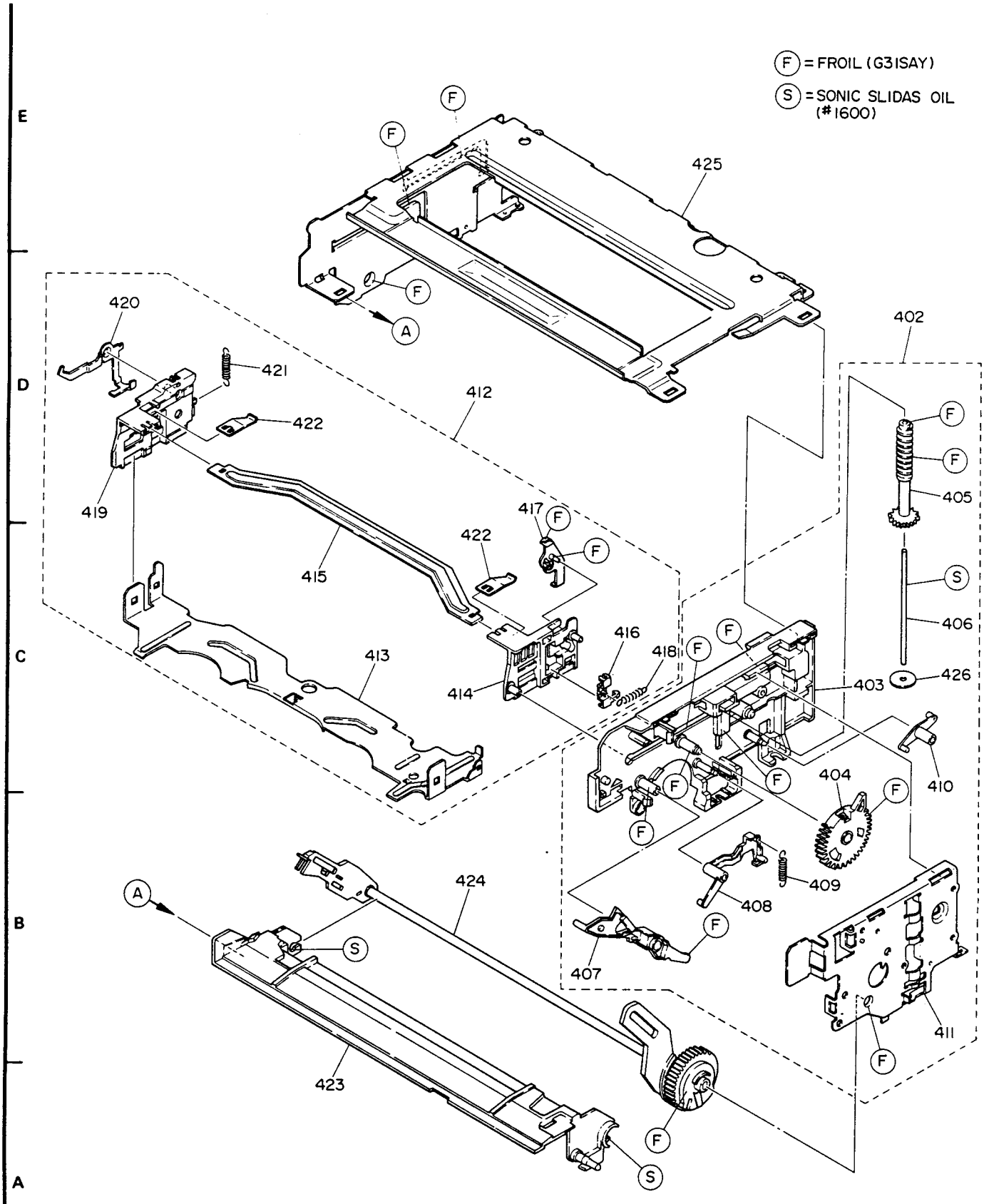

998
999
503
501
223
FULL
ERASE
HEAD
226
225
233
502
960
956
205
954
AUDIO
CONTROL
HEAD
955
222
960
963
220
963
963
204
207
202
228
210
211
961
219
220
961
203
214
212
213
206
958
221
255
247
216
245
217
218
209
208
959
242
243
248
241
IL (G31SAY)
IC SLIDAS OIL
500)
2
3
4
5


999
503
230
960
956
205
954
AUDIO
CONTROL
HEAD
955
235
957
244
F
204
207
202
961
203
214
246
S
206
221
255
247
F
245
958
236
209
208
F
238
F
S
F
242
240
F
F
243
F
251
F
248
241
S
250
249
F
S
F
239
237
S
252
5
6
7
8
0

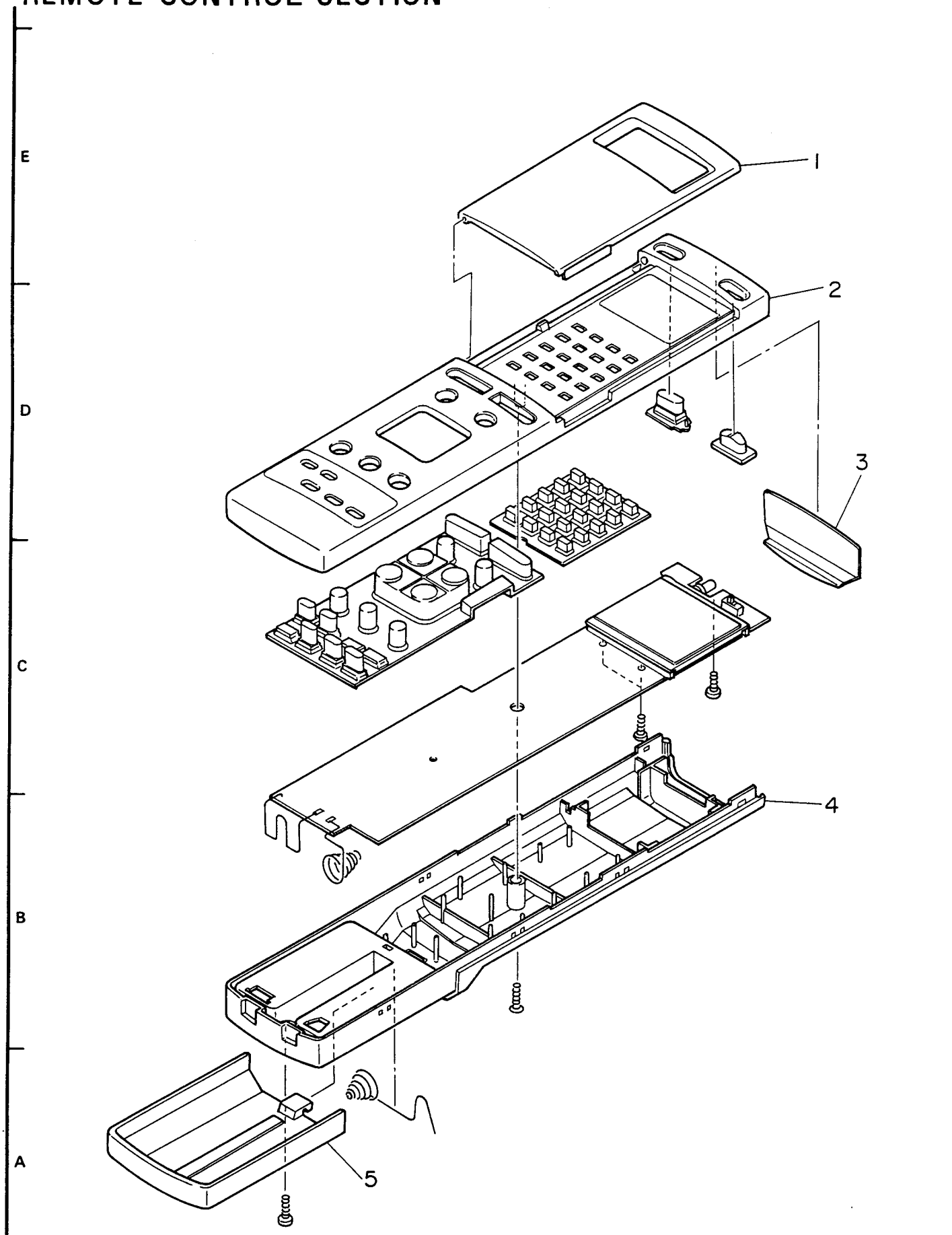
CHASSIS (II) SECTION



CASSETTE LOADING MECHANISM SECTION



REMOTE CONTROL SECTION



HITACHI

TK | No.3319E,G

SERVICE MANUAL

VT-M720E SEREIS

SUPPLEMENT

Technical Data

This manual shows the changes to the schematic and circuit board diagrams in the VT-M720E series manual issued previously.

CONTENTS

CHAPTER 5

Main Circuit Board Diagram 5-1
Y/Chroma Circuit Board Diagrams 5-10
Y/Chroma Schematic Diagram 5-12

Ergänzung

Technische Daten

Diese Anleitung zeigt die Änderungen der Schaltpläne und der Leiterplatten-Diagramme in der bereits früher veröffentlichten Anleitung der VT-M720E Serie.

Inhalt

Kapitel 5

Haupt-Leiterplattendiagramm 5-1
Y/Chroma-Leiterplatten-diagramme 5-10
Y/Chroma-Schaltplan 5-12

MANUALS RELATED TO THE VT-720E SERIES

Model Name	Language	Manual No.
VT-M720E (UK) VT-M722E (UK)	English	3183E
VT-M720E (CT) VT-M722E (CT) VT-M725E (VPS) VT-M726E (VPS)	English	3184E
	Deutsch	3186G
VT-M727E (GK)	English	3225E
VT-M728E (DS,SW,SWM,AU,AUB)	English	3188E

Anleitungen betreffend die VT-M720E Serie

Modellbezeichnung	Sprache	Anleitungs-Nr.
VT-M720E (UK) VT-M722E (UK)	Englisch	3183E
VT-M720E (CT) VT-M722E (CT) VT-M725E (VPS) VT-M726E (VPS)	Englisch	3184E
	Deutsch	3186G
VT-M727E (GK)	Englisch	3225E
VT-M728E (DS,SW,SWM,AU,AUB)	Englisch	3188E

VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

VHS

Dieser Video-Recorder entspricht dem VHS-Format. Für richtigen Betrieb müssen daher VHS-Magnetband-Cassetten verwendet werden.

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

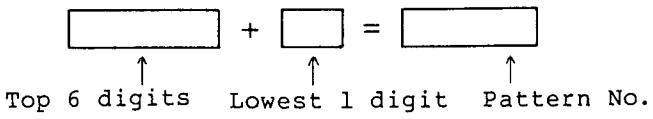
VIDEO CASSETTE RECORDER

July 1990 TOKAI WORKS

1. MAIN CIRCUIT BOARD

Refer to the table for changes to the main circuit board shown below to check the pattern No. and use the corresponding main circuit board diagram in this manual for servicing.

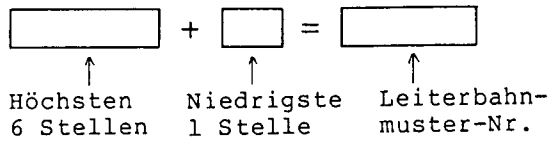
The following shows the position of the stamped pattern No.



1. Haupt-Leiterplatte

Änderungen der Haupt-Leiterplatte sind der nachfolgenden Tabelle zu entnehmen, wobei die Leiterbahnmuster-Nr. zu kontrollieren ist; für Wartungszwecke ist das entsprechende Diagramm der Haupt-Leiterplatte in dieser Anleitung zu beachten.

Nachfolgend ist die Position der gestempelten Leiterbahnmuster-Nr. dargestellt.



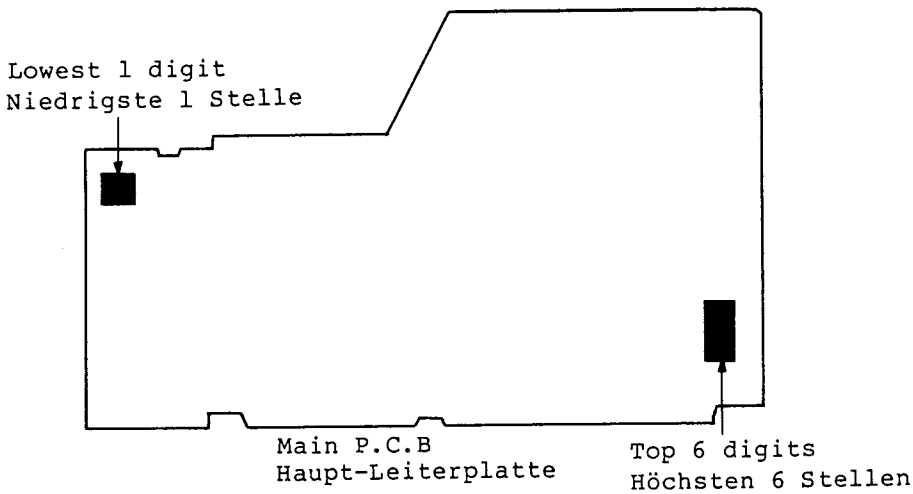


Table for changes to main circuit board

Model Name	Pattern No.	Page
VT-M720E (UK) VT-M722E (UK) VT-M720E (CT) VT-M722E (CT) VT-M725E (VPS) VT-M726E (VPS)	1510843 1510844	5-2 (NOTE 1)
	1513431 1513432	5-4 (NOTE 1)
VT-M727E (GK) VT-M728E (AU,AUB)	1509482 1509483	5-6 (NOTE 1)
VT-M728E (DS,SW,SWM)	1509492 1509493	
VT-M727E (GK) VT-M728E (AU,AUB)	1509484 1509485	5-8 (NOTE 1)
VT-M728E (DS,SW,SWM)	1509494 1509495	

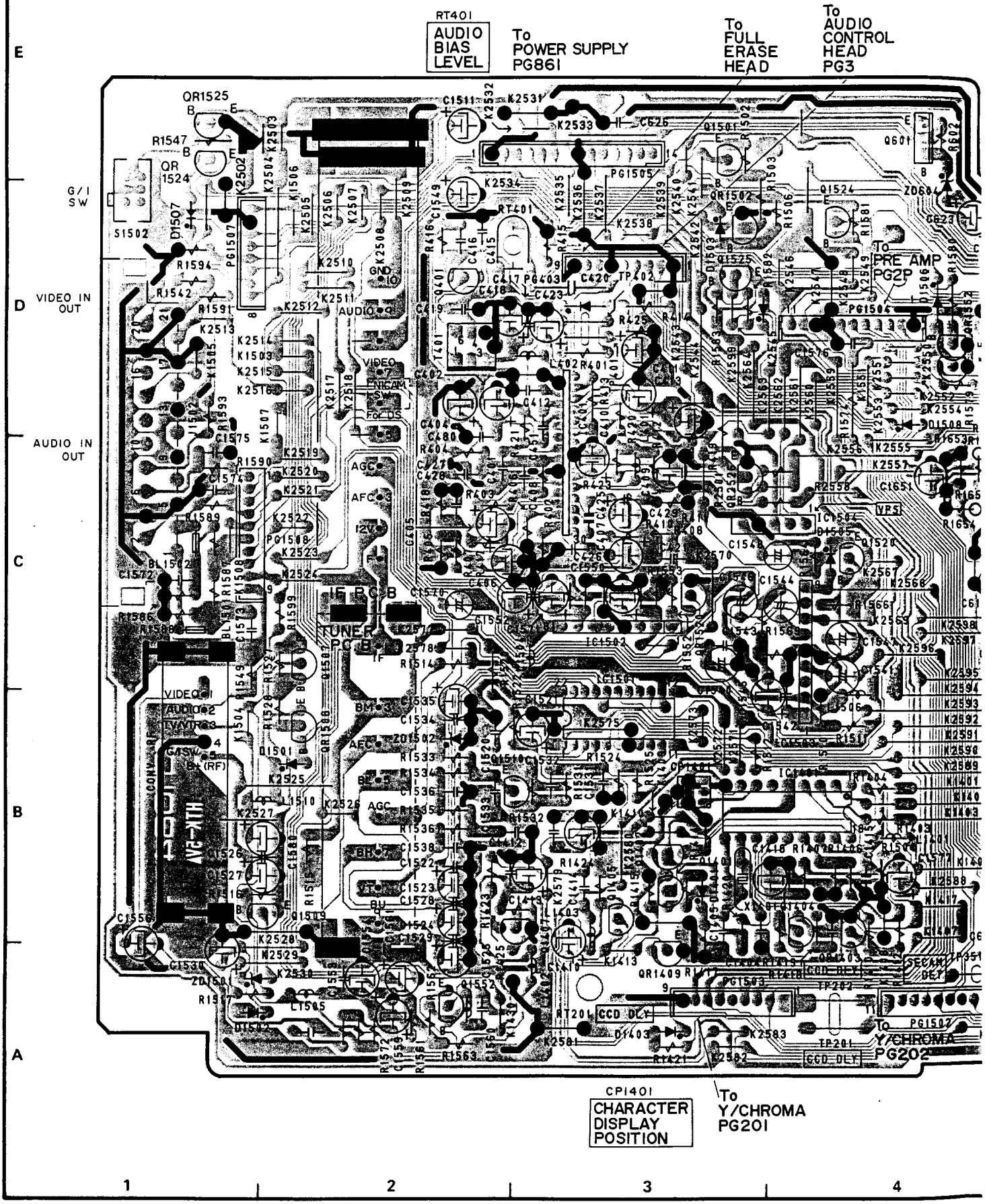
NOTE 1:
Although the pattern No. has been changed since parts that were attached to the solder side have been moved to the component side, the circuit board is the same.

Tabelle der Änderungen Haupt-Leiterplatte

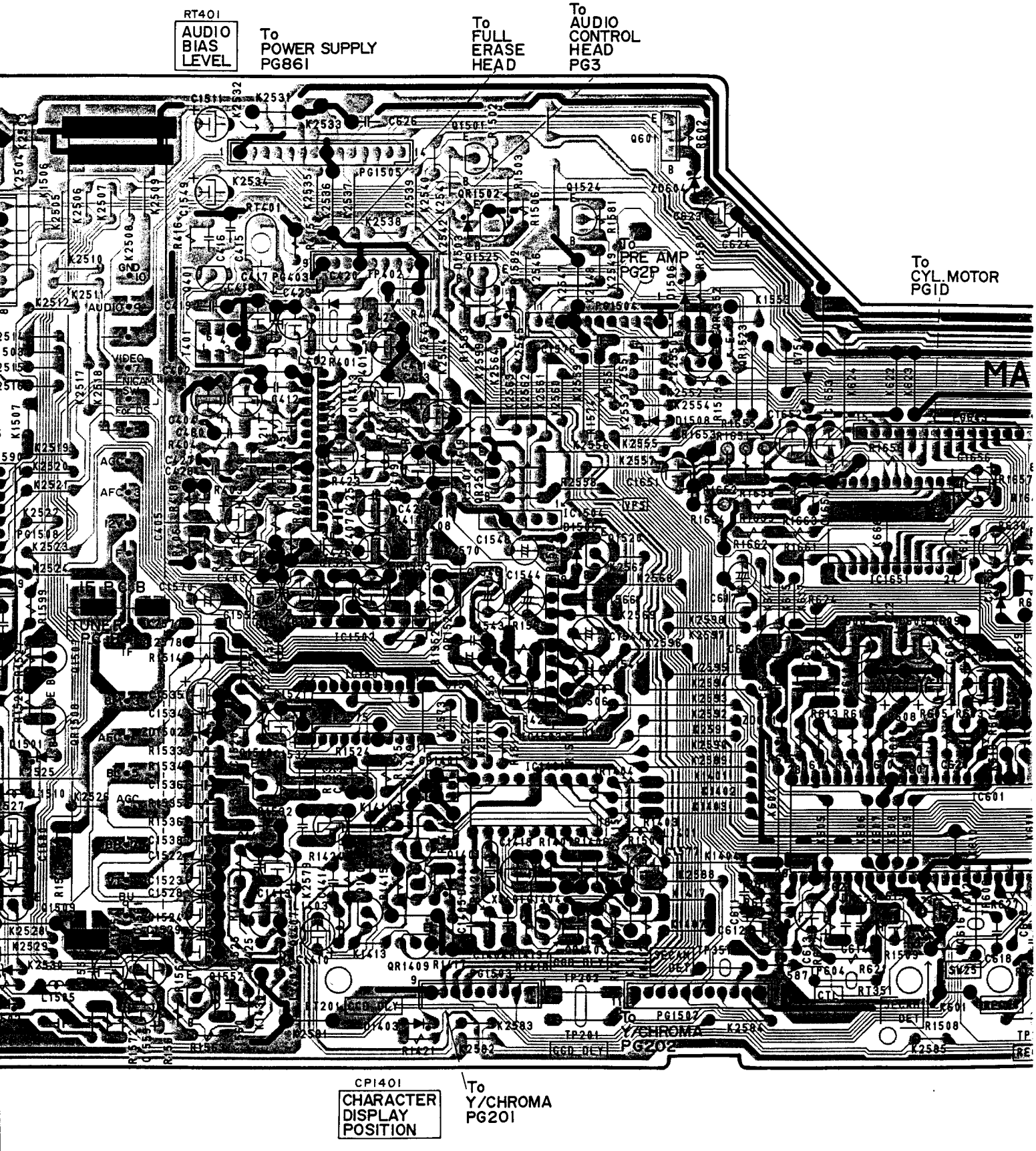
Modellbezeichnung	Leiterbahn-muster-Nr.	Seite
VT-M720E (UK) VT-M722E (UK) VT-M720E (CT) VT-M722E (CT) VT-M725E (VPS) VT-M726E (VPS)	1510843 1510844	5-2 (Hinweis 1)
	1513431 1513432	5-4 (Hinweis 1)
VT-M727E (GK) VT-M728E (AU,AUB)	1509482 1509483	5-6 (Hinweis 1)
VT-M728E (DS,SW,SWM)	1509492 1509493	
VT-M727E (GK) VT-M728E (AU,AUB)	1509484 1509485	5-8 (Hinweis 1)
VT-M728E (DS,SW,SWM)	1509494 1509495	

Hinweis 1:
Obwohl die Leiterbahnmuster-Nr. geändert wurde, da Teile von der Leiterbahnseite auf die Bestückungsseite verlegt wurden, ist die Leiterplatte gleich geblieben.

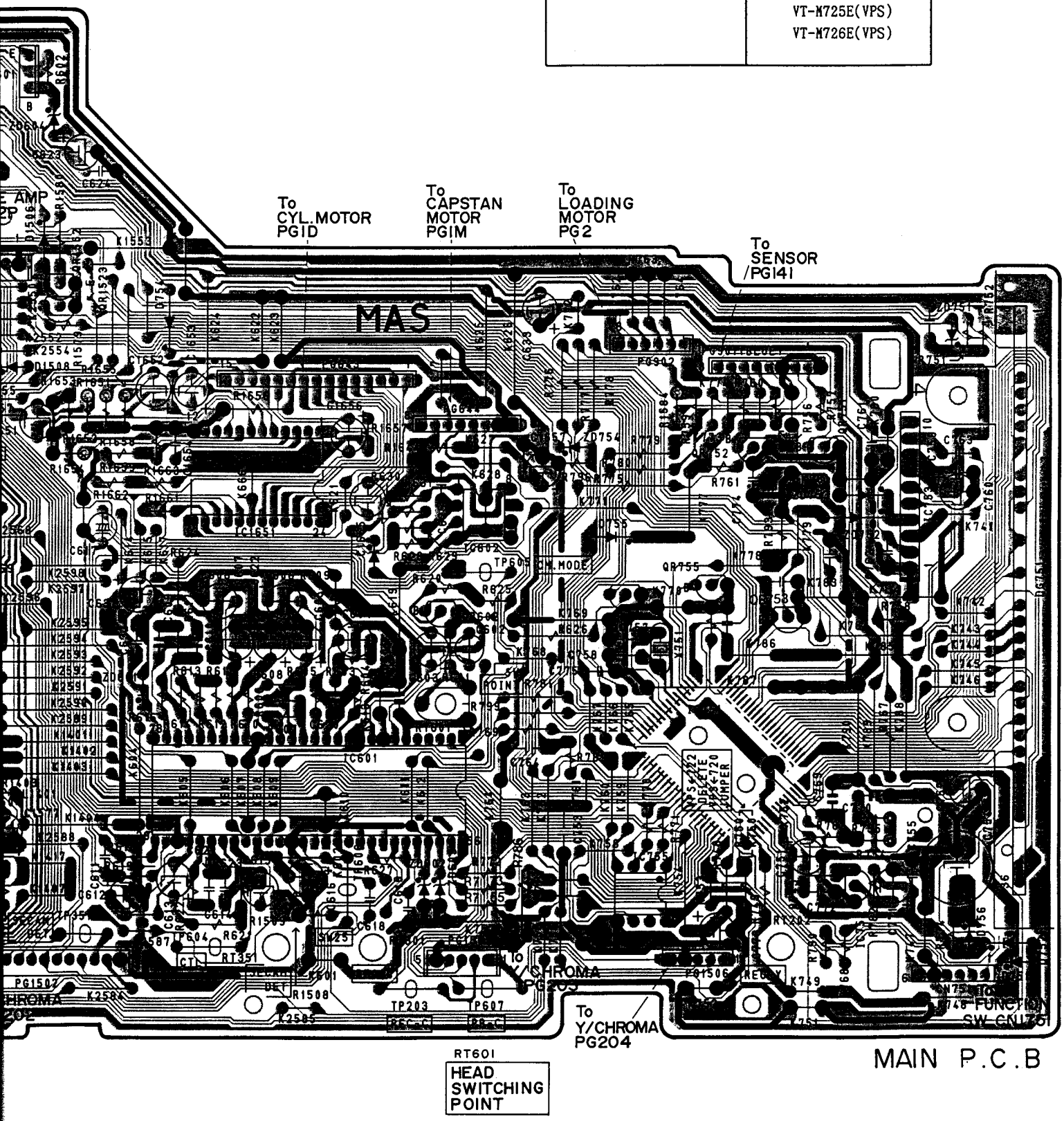
MAIN CIRCUIT BOARD DIAGRAM
Haupt-Leiterplattendiagramm



BOARD DIAGRAM
Platinendiagramm

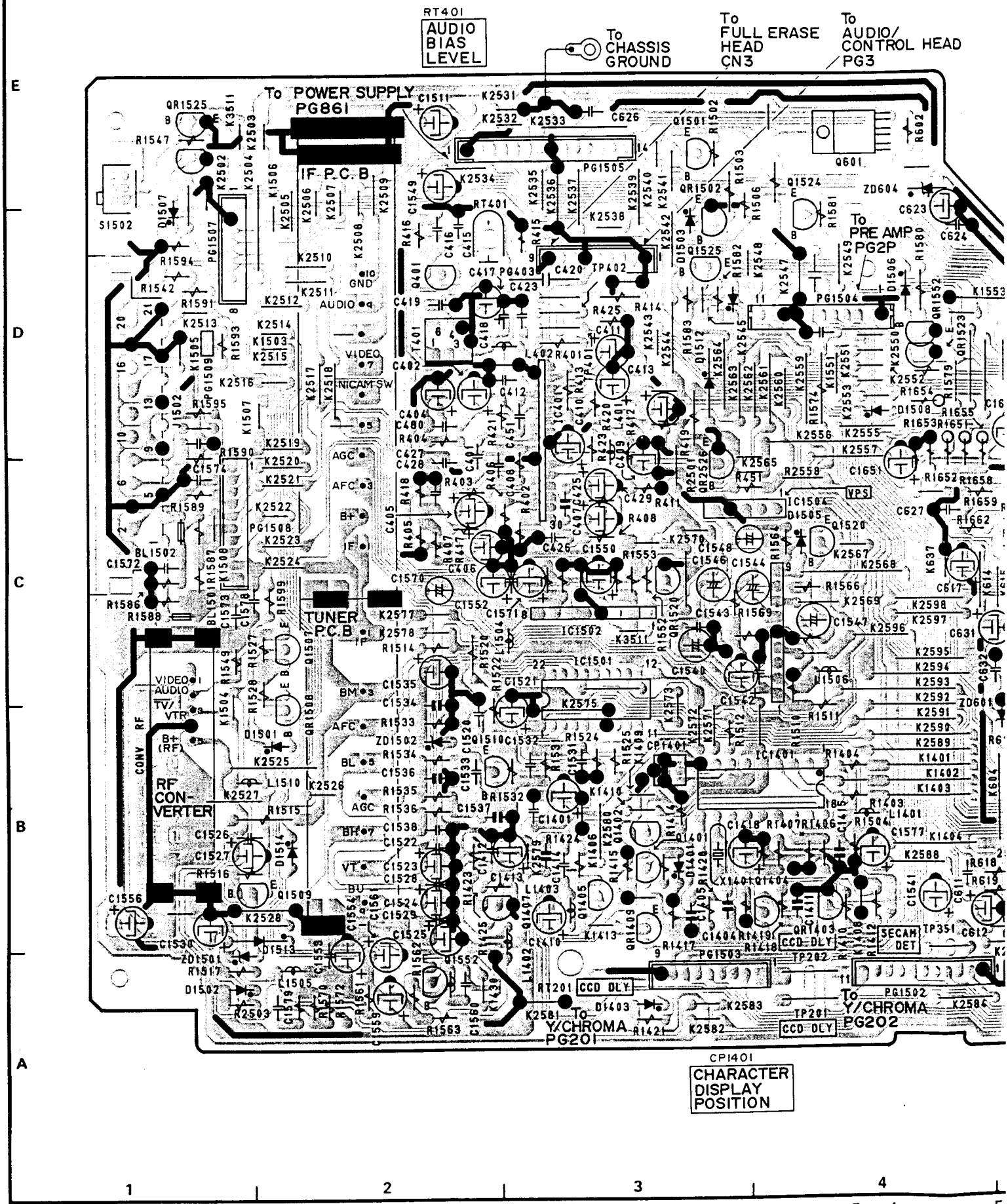


Pattern No. Leiterbahnmuster-Nr.	Applicable Models Zutreffende Modelle
1510843 1510844	VT-M720E(UK) VT-M722E(UK) VT-M720E(CT) VT-M722E(CT) VT-M725E(VPS) VT-M726E(VPS)

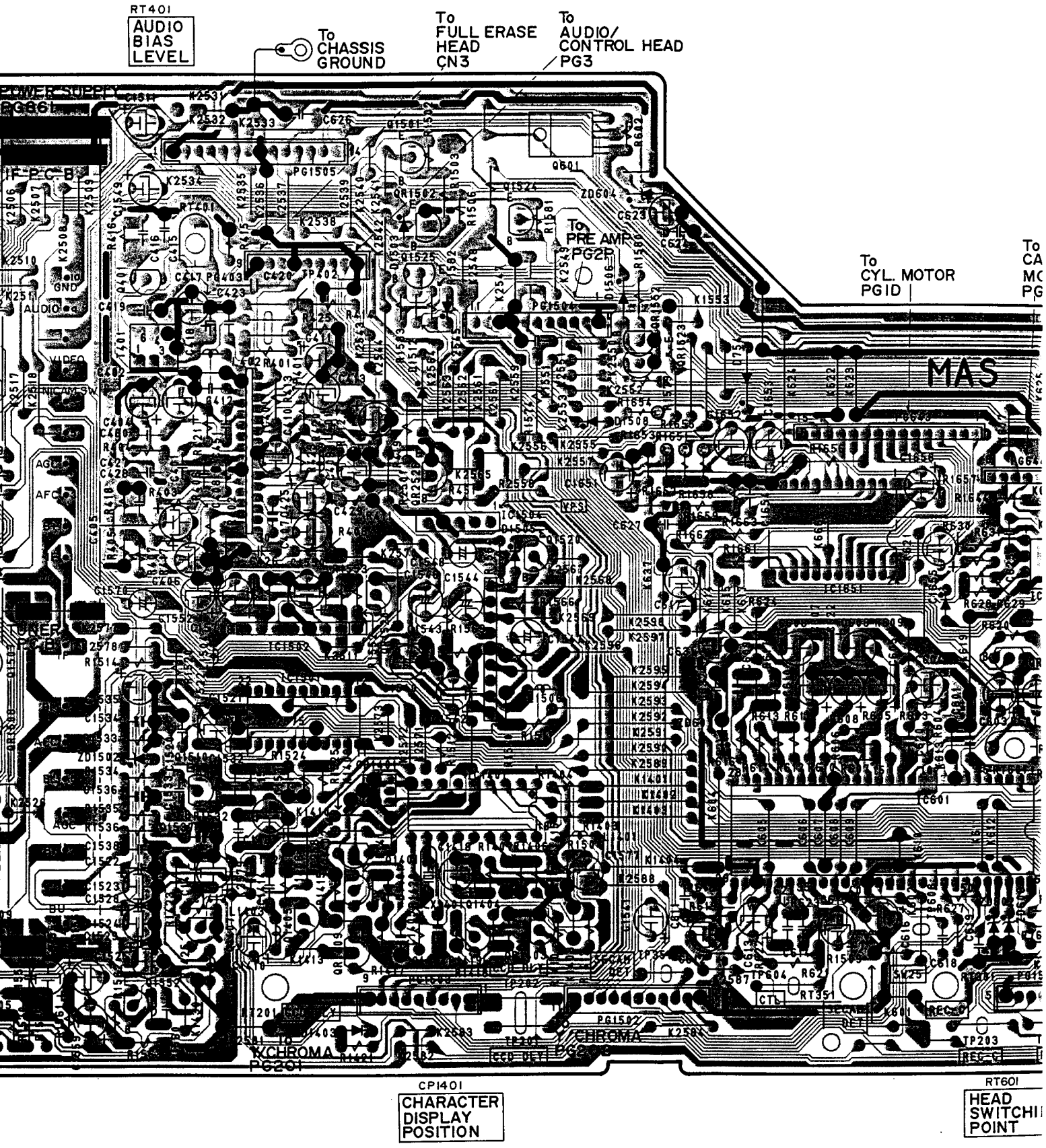


MAIN P.C.B

MAIN CIRCUIT BOARD
Haupt-Leiterplattendiagramm

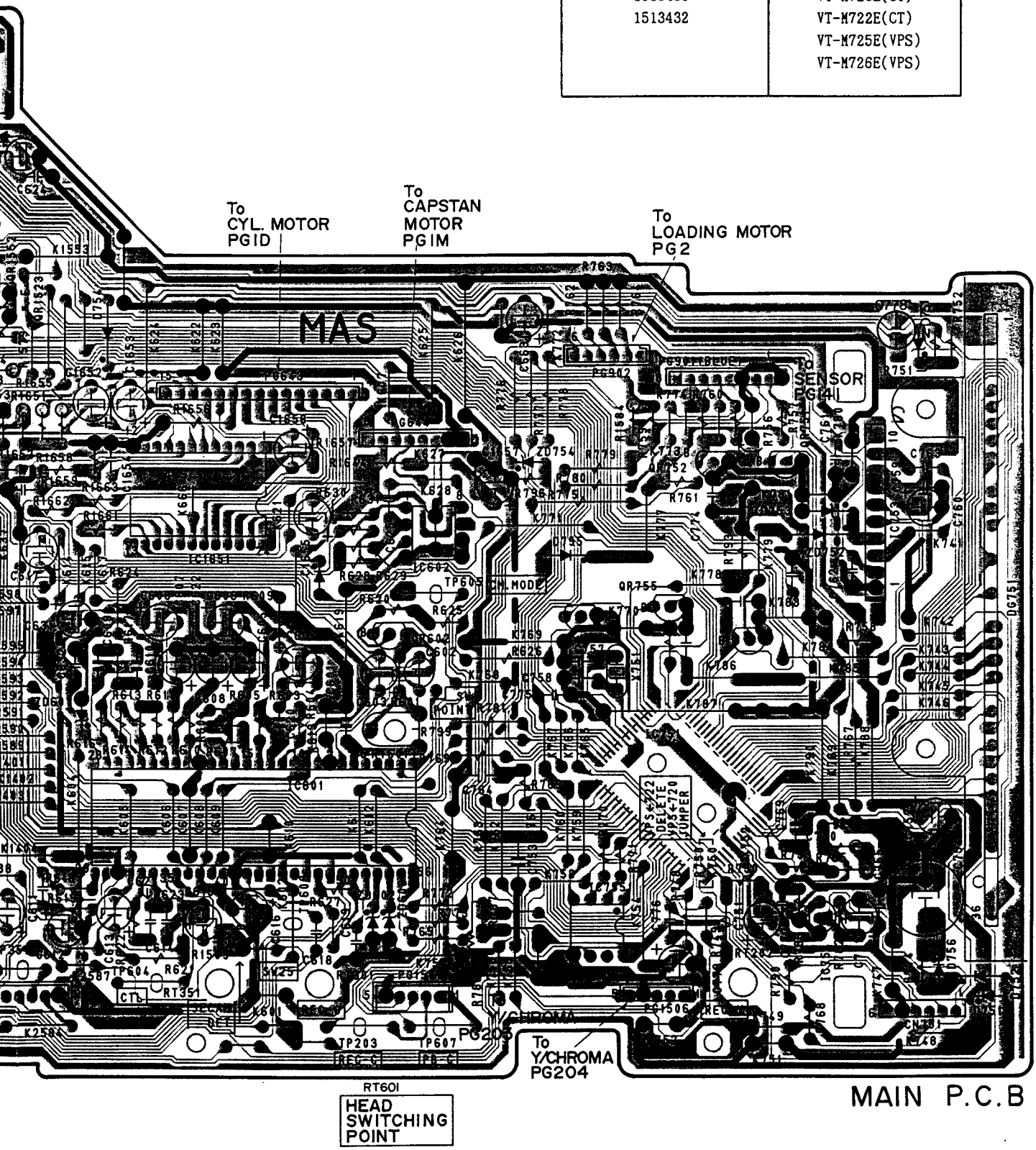


RD
ttendiagramm



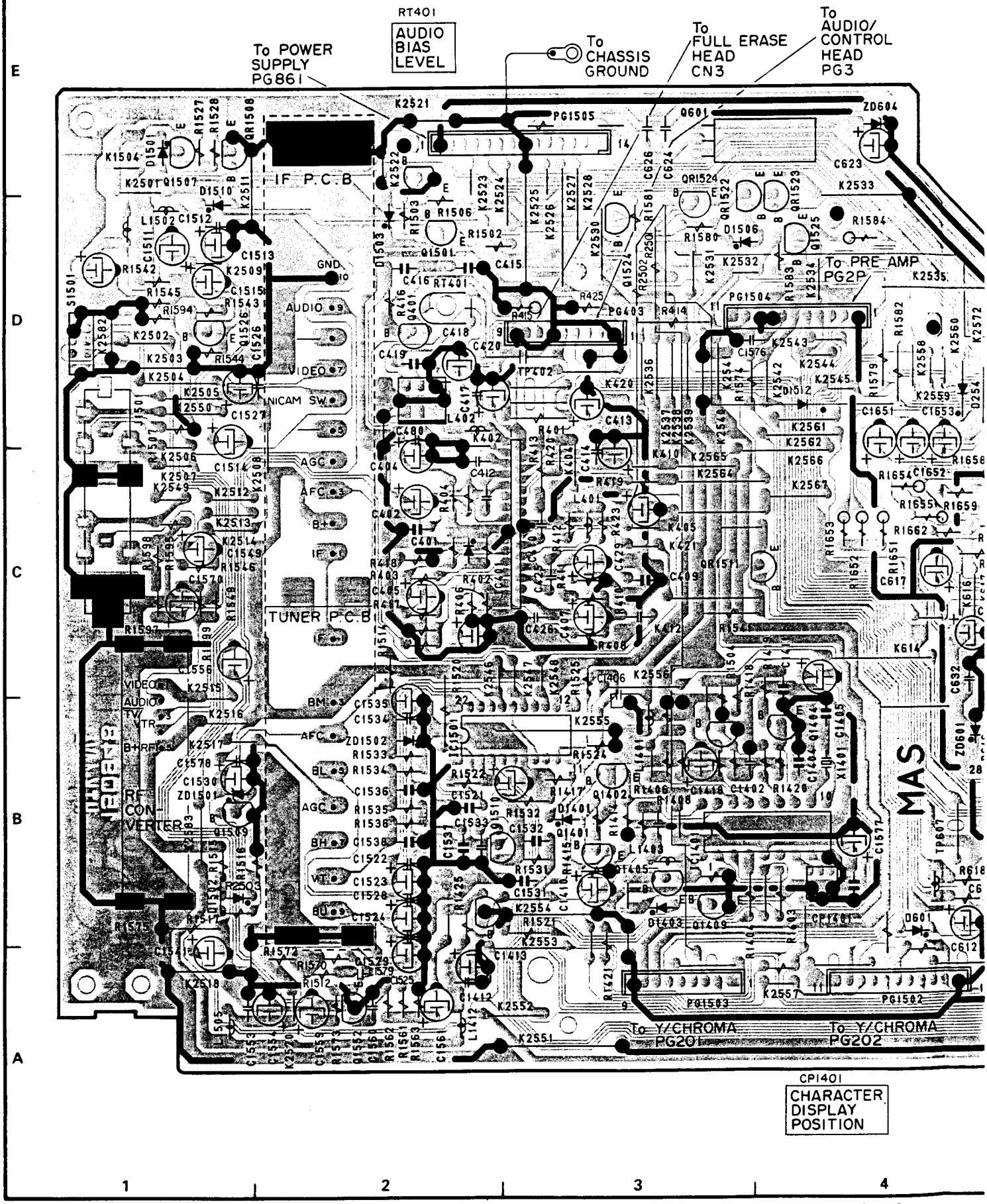
Pattern No. Leiterbahnmuster-Nr.	Applicable Models Zutreffende Modelle
1513431 1513432	VT-M720E(UK) VT-M722E(UK) VT-M720E(CT) VT-M722E(CT) VT-M725E(VPS) VT-M726E(VPS)

HEAD

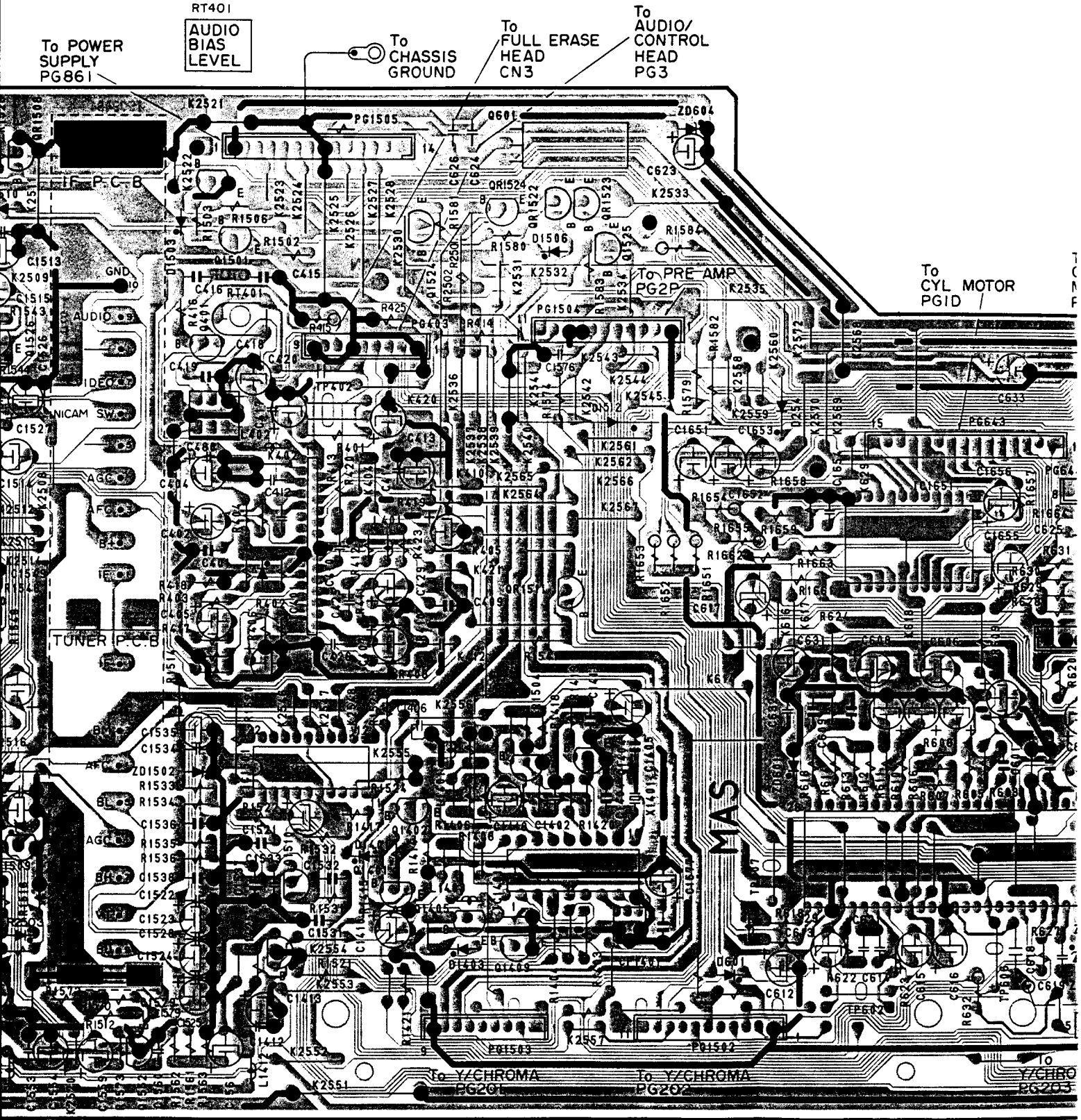


MAIN CIRCUIT BOARD DIAGRAM

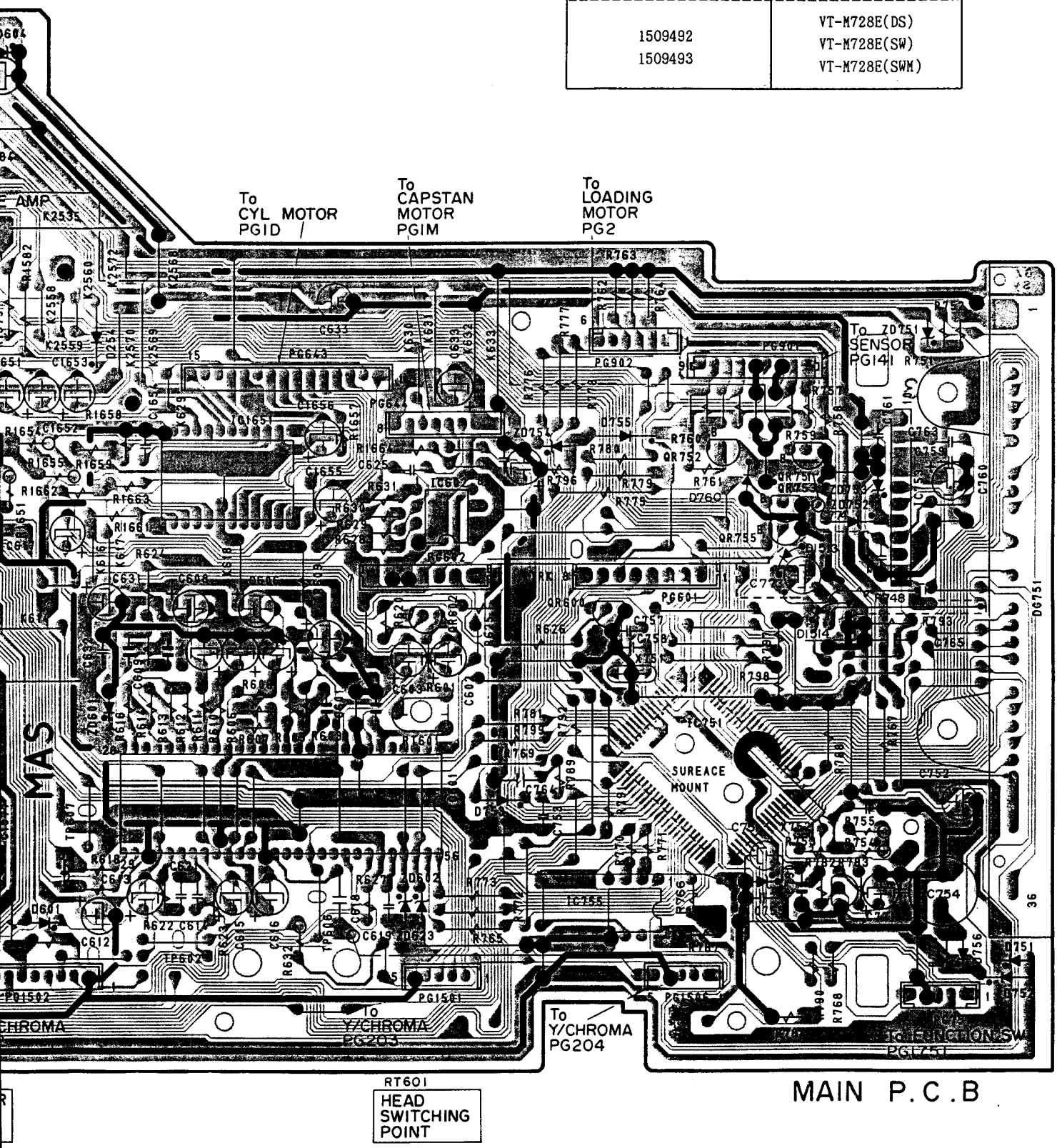
Haupt-Leiterplattendiagramm



BOARD DIAGRAM
erplattendiagramm

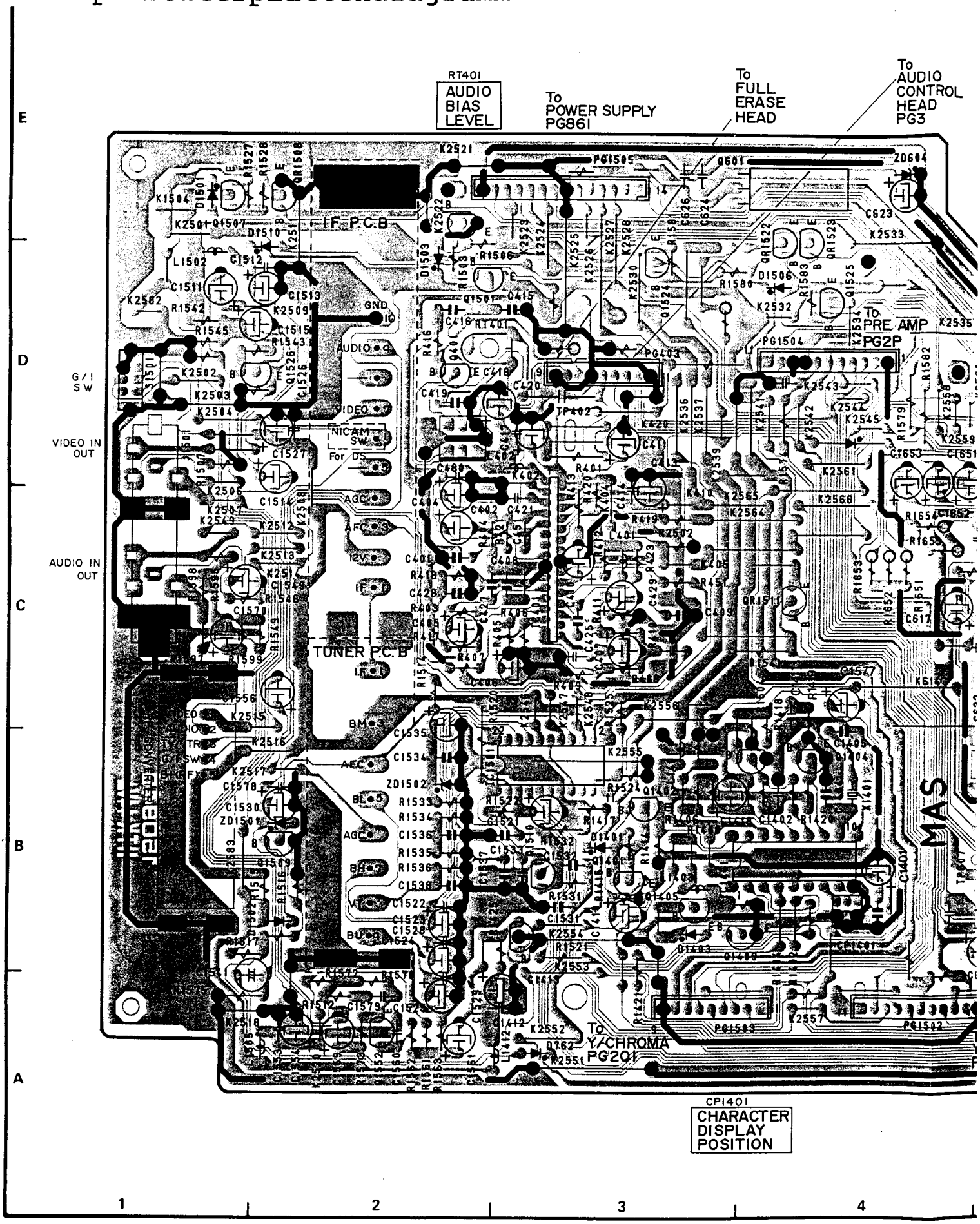


Pattern No. Leiterbahnmuster-Nr.	Applicable Models Zutreffende Modelle
1509482 1509483	VT-M727E(GK) VT-M728E(AU) VT-M728E(AUB)
1509492 1509493	VT-M728E(DS) VT-M728E(SW) VT-M728E(SWM)

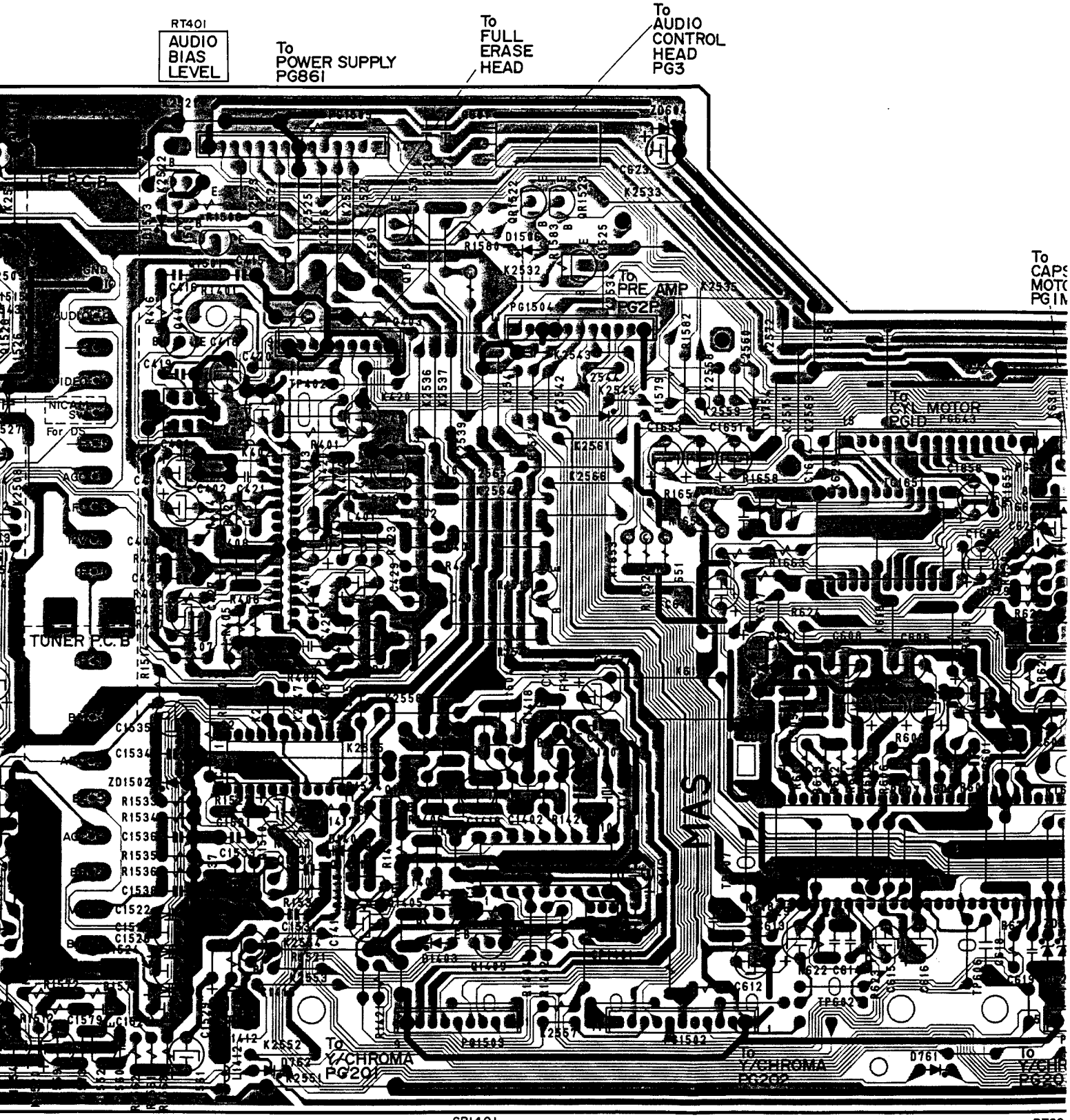


MAIN P.C.B

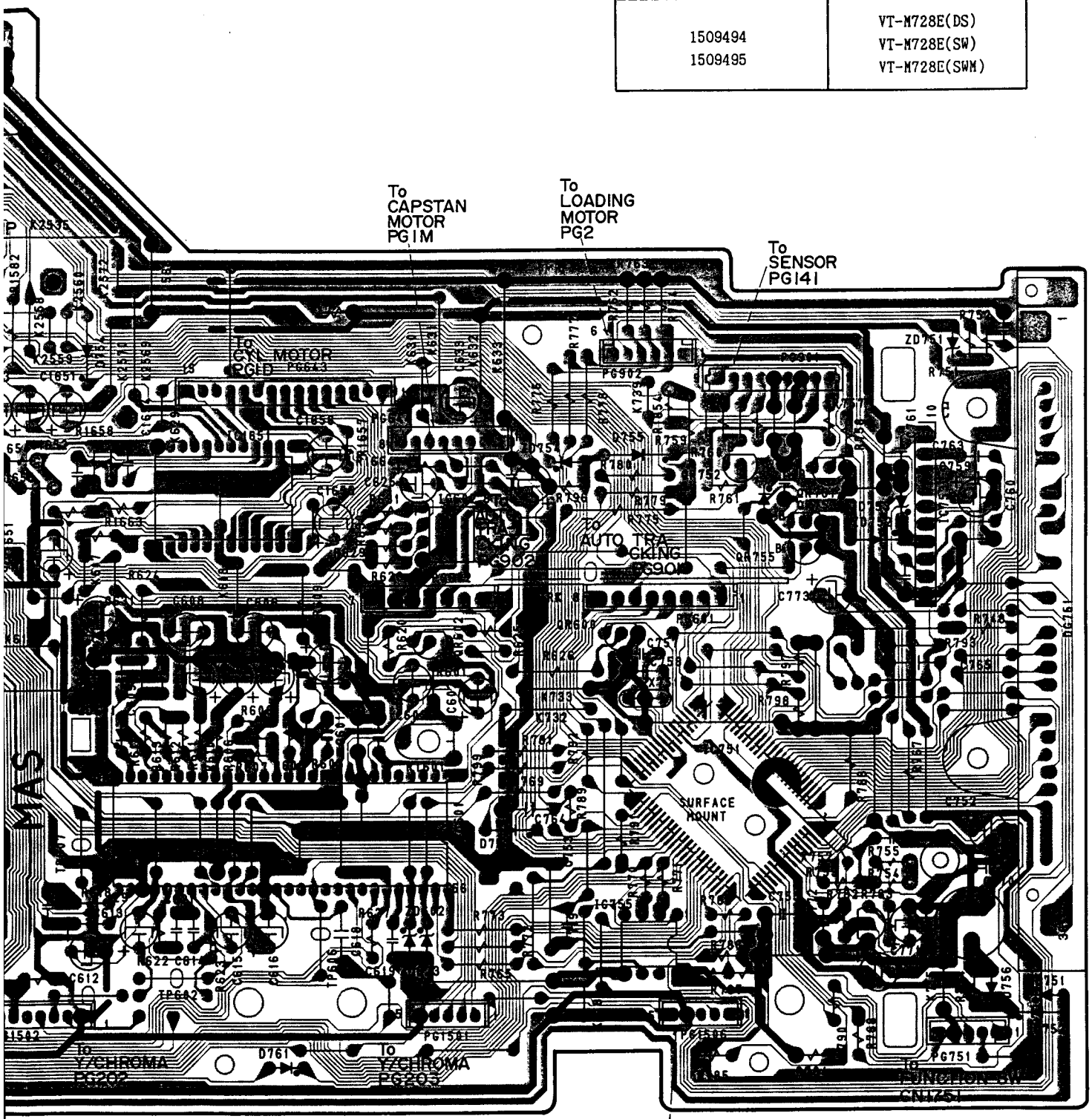
MAIN CIRCUIT BOARD
Haupt-Leiterplattendiagramm



RD
attendiagramm



Pattern No. Leiterbahnmuster-Nr.	Applicable Models Zutreffende Modelle
1509484 1509485	VT-M728E(AU) VT-M728E(AUB)
1509494 1509495	VT-M728E(DS) VT-M728E(SW) VT-M728E(SWM)



Y/CHROMA CIRCUIT BOARD DIAGRAMS Y/Chroma-Leiterplatt

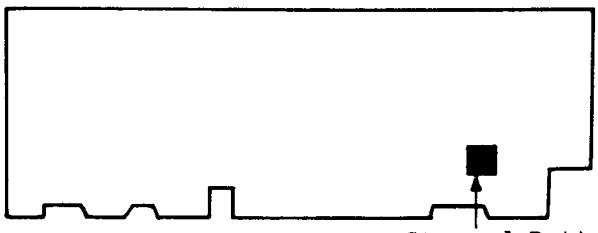
The following shows the stamped position of the pattern No. Check the pattern No. and refer to the corresponding Y/chroma circuit board diagram in this manual.

Part No. 4:
Refer to the service manual issued previously

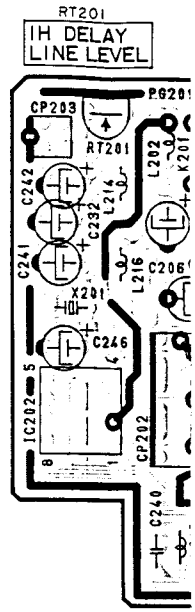
Part No.1:
Refer to this manual

Nachfolgend ist die Position der gestempelten Leiterbahnmuster-Nr. dargestellt. Kontrollieren Sie die Leiterbahnmuster-Nr. und beachten Sie das entsprechende Y/Chroma-Leiterplattendiagramm in dieser Anleitung.

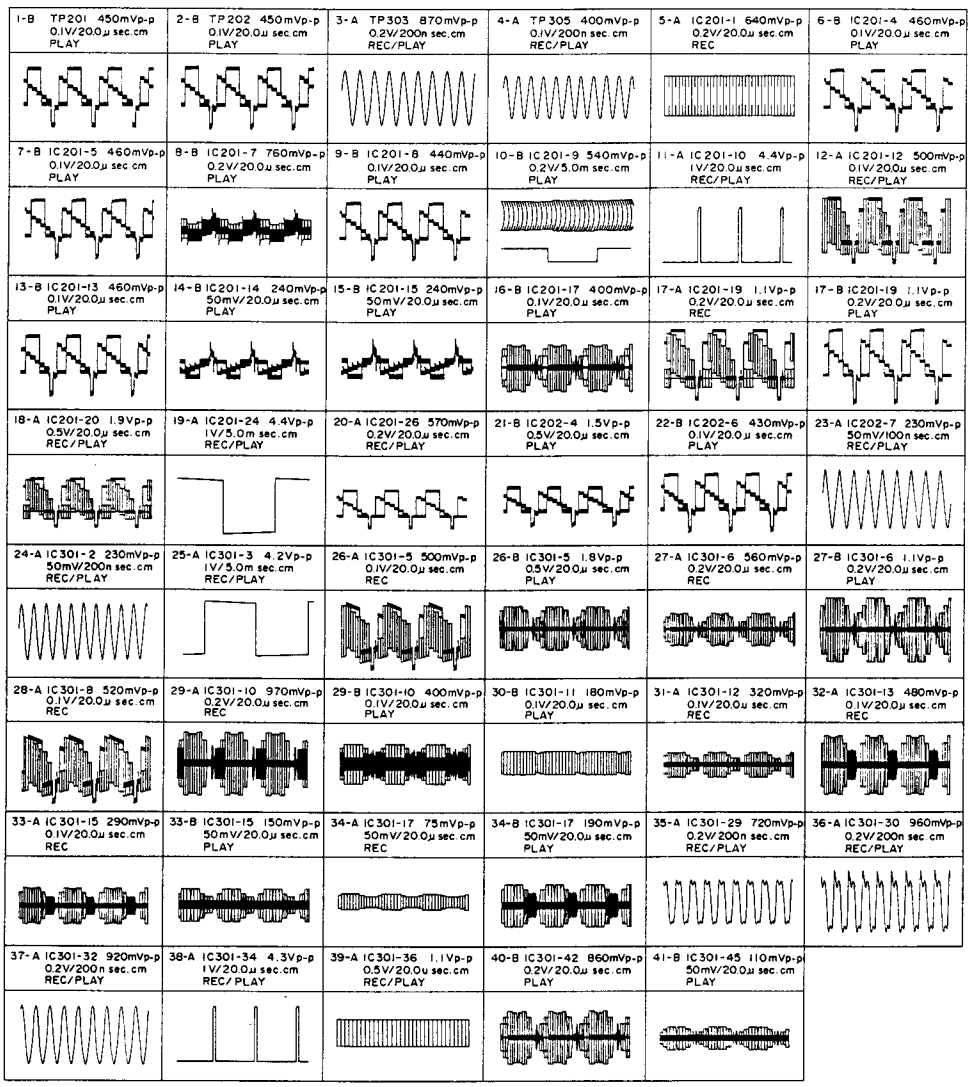
Teile-Nr. 4:
Siehe früher Veröffentlichte Wartungsanleitung
Teile-Nr. 1:
Siehe Diese Anleitung

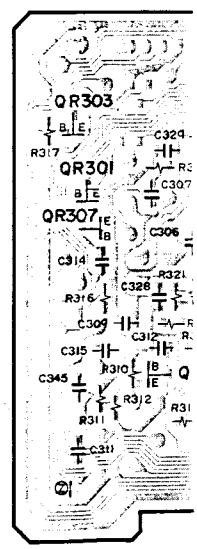


Stamped Pattern No.
Gestempelte Leiterbahnmuster-Nr.



Y/CHROMA WAVEFORMS Y/Chroma-Wellenform


1-B TP201 450mVp-p 0.1V/20.0μ sec.cm PLAY
2-B TP202 450mVp-p 0.1V/20.0μ sec.cm PLAY
3-A TP303 870mVp-p 0.2V/200n sec.cm REC/PLAY
4-A TP305 400mVp-p 0.1V/200n sec.cm REC/PLAY
5-A IC201-1 640mVp-p 0.2V/20.0μ sec.cm REC
6-B IC201-4 460mVp-p 0.1V/20.0μ sec.cm PLAY
7-B IC201-5 460mVp-p 0.1V/20.0μ sec.cm PLAY
8-B IC201-7 760mVp-p 0.2V/20.0μ sec.cm PLAY
9-B IC201-8 440mVp-p 0.1V/20.0μ sec.cm PLAY
10-B IC201-9 540mVp-p 0.2V/5.0m sec.cm PLAY
11-A IC201-10 4.4Vp-p 1V/20.0μ sec.cm REC/PLAY
12-A IC201-12 500mVp-p 0.1V/20.0μ sec.cm REC/PLAY
13-B IC201-13 460mVp-p 0.1V/20.0μ sec.cm PLAY
14-B IC201-14 240mVp-p 50mV/20.0μ sec.cm PLAY
15-B IC201-15 240mVp-p 50mV/20.0μ sec.cm PLAY
16-B IC201-17 400mVp-p 0.1V/20.0μ sec.cm PLAY
17-A IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm REC
17-B IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
18-A IC201-20 1.9Vp-p 0.5V/20.0μ sec.cm REC/PLAY
19-A IC201-24 4.4Vp-p 1V/5.0m sec.cm REC/PLAY
20-A IC201-26 570mVp-p 0.2V/20.0μ sec.cm REC/PLAY
21-B IC202-4 1.5Vp-p 0.5V/20.0μ sec.cm PLAY
22-B IC202-6 430mVp-p 0.1V/20.0μ sec.cm PLAY
23-A IC202-7 230mVp-p 50mV/100n sec.cm REC/PLAY
24-A IC301-2 230mVp-p 50mV/200n sec.cm REC/PLAY
25-A IC301-3 4.2Vp-p 1V/5.0m sec.cm REC/PLAY
26-A IC301-5 500mVp-p 0.1V/20.0μ sec.cm REC
26-B IC301-5 1.8Vp-p 0.5V/20.0μ sec.cm PLAY
27-A IC301-6 560mVp-p 0.2V/20.0μ sec.cm REC
27-B IC301-6 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
28-A IC301-8 520mVp-p 0.1V/20.0μ sec.cm REC
29-A IC301-10 970mVp-p 0.2V/20.0μ sec.cm REC
29-B IC301-10 400mVp-p 0.1V/20.0μ sec.cm PLAY
30-B IC301-11 180mVp-p 0.1V/20.0μ sec.cm PLAY
31-A IC301-12 320mVp-p 0.1V/20.0μ sec.cm REC
32-A IC301-13 480mVp-p 0.1V/20.0μ sec.cm REC
33-A IC301-15 290mVp-p 0.1V/20.0μ sec.cm REC
33-B IC301-15 150mVp-p 50mV/20.0μ sec.cm PLAY
34-A IC301-17 75mVp-p 50mV/20.0μ sec.cm REC
34-B IC301-17 190mVp-p 50mV/20.0μ sec.cm PLAY
35-A IC301-29 720mVp-p 0.2V/200n sec.cm REC/PLAY
36-A IC301-30 960mVp-p 0.2V/200n sec.cm REC/PLAY
37-A IC301-32 920mVp-p 0.2V/200n sec.cm REC/PLAY
38-A IC301-34 4.3Vp-p 1V/20.0μ sec.cm REC/PLAY
39-A IC301-36 1.1Vp-p 0.5V/20.0μ sec.cm REC/PLAY
40-B IC301-42 860mVp-p 0.2V/20.0μ sec.cm PLAY
41-B IC301-45 110mVp-p 50mV/20.0μ sec.cm PLAY



NOTE : MARK

ARD DIAGRAMS Y/Chroma-Leiterplattendiagramme

position
ttern No.
/chroma
nual.

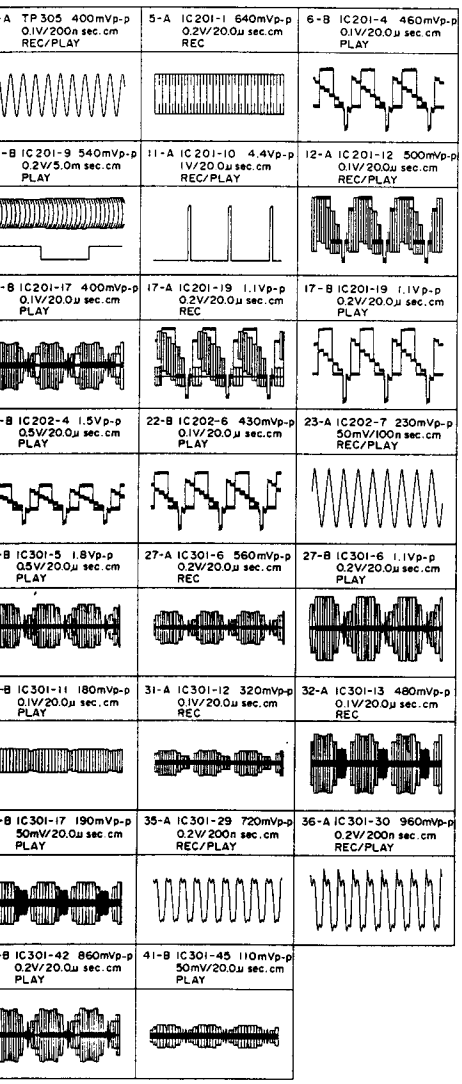
issued

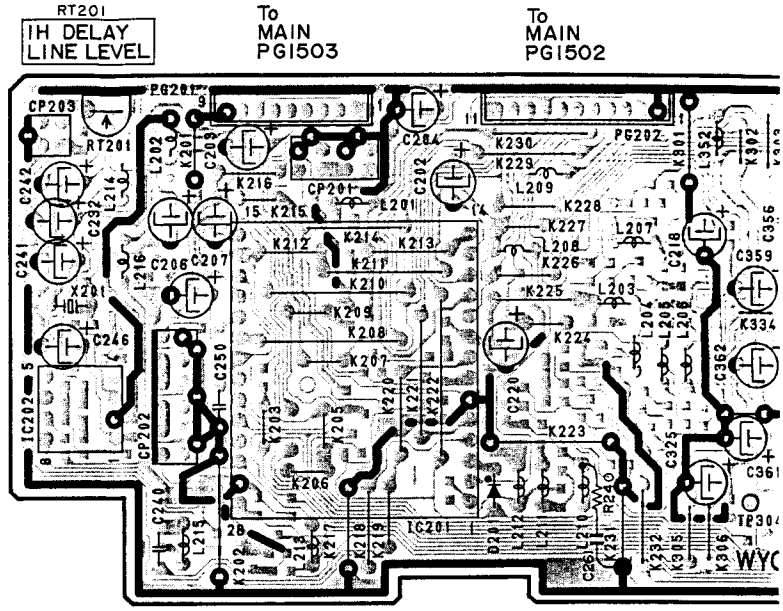
Nachfolgend ist die Position der gestempelten Leiterbahnmuster-Nr. dargestellt. Kontrollieren Sie die Leiterbahnmuster-Nr. und beachten Sie das entsprechende Y/Chroma-Leiterplattendiagramm in dieser Anleitung.

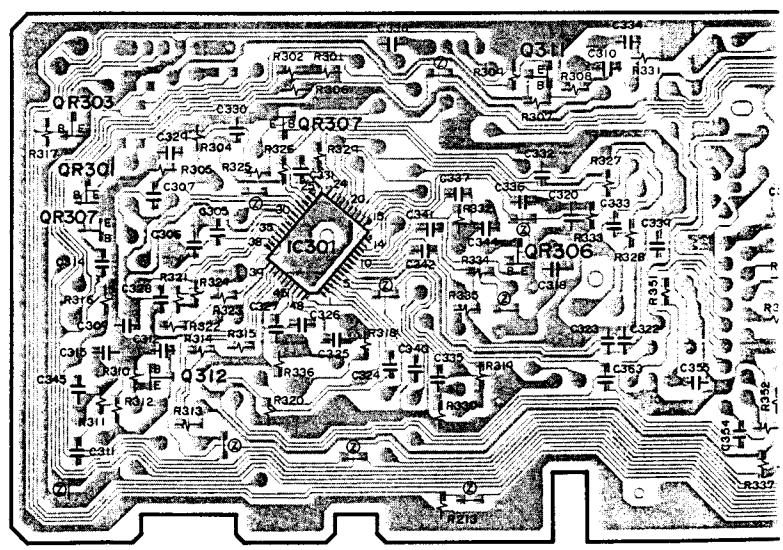
Teile-Nr. 4:
Siehe früher Veröffentlichte Wartungsanleitung
Teile-Nr. 1:
Siehe Diese Anleitung

d Pattern No.
pelte Leiterbahnmuster-Nr.

RMS Y/Chroma-Wellenform

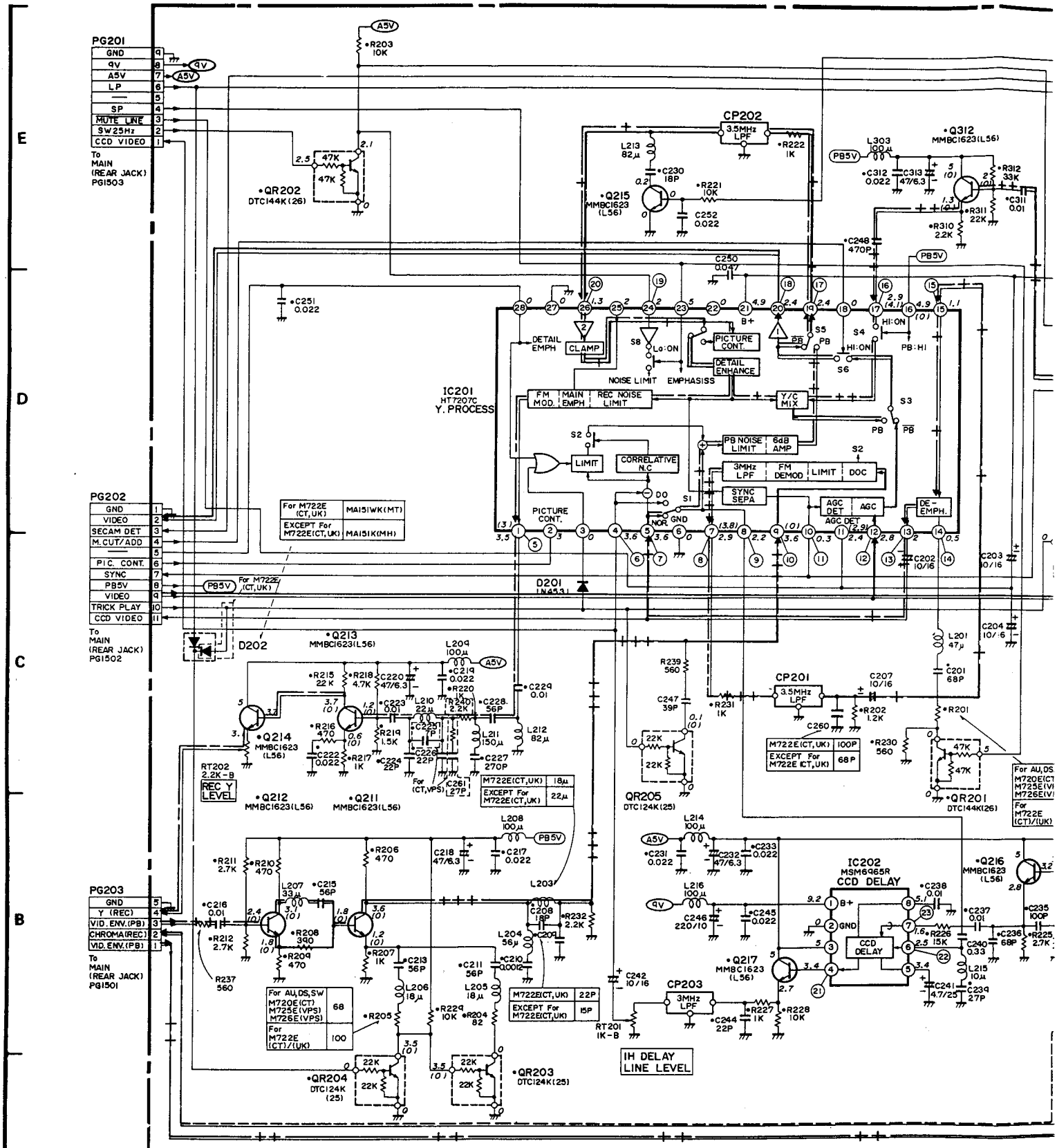

A TP305 400mVp-p 0.1V/200n sec.cm REC/PLAY
5-A IC201-1 640mVp-p 0.2V/20.0μ sec.cm REC
6-B IC201-4 460mVp-p 0.1V/20.0μ sec.cm PLAY
-B IC201-9 540mVp-p 0.2V/5.0m sec.cm PLAY
11-A IC201-10 4.4Vp-p 1V/20.0μ sec.cm REC/PLAY
12-A IC201-12 500mVp-p 0.1V/20.0μ sec.cm REC/PLAY
-B IC201-17 400mVp-p 0.1V/20.0μ sec.cm PLAY
17-A IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm REC
17-B IC201-19 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
-B IC202-4 1.5Vp-p 0.5V/20.0μ sec.cm PLAY
22-B IC202-6 430mVp-p 0.1V/20.0μ sec.cm PLAY
23-A IC202-7 230mVp-p 50mV/100n sec.cm REC/PLAY
-B IC301-5 1.8Vp-p 0.5V/20.0μ sec.cm PLAY
27-A IC301-6 560mVp-p 0.2V/20.0μ sec.cm REC
27-B IC301-6 1.1Vp-p 0.2V/20.0μ sec.cm PLAY
-B IC301-11 180mVp-p 0.1V/20.0μ sec.cm PLAY
31-A IC301-12 320mVp-p 0.1V/20.0μ sec.cm REC
32-A IC301-13 480mVp-p 0.1V/20.0μ sec.cm REC
-B IC301-17 190mVp-p 50mV/20.0μ sec.cm PLAY
35-A IC301-29 720mVp-p 0.2V/200n sec.cm REC/PLAY
36-A IC301-30 960mVp-p 0.2V/200n sec.cm REC/PLAY
-B IC301-42 860mVp-p 0.2V/20.0μ sec.cm PLAY
41-B IC301-45 110mVp-p 50mV/20.0μ sec.cm PLAY



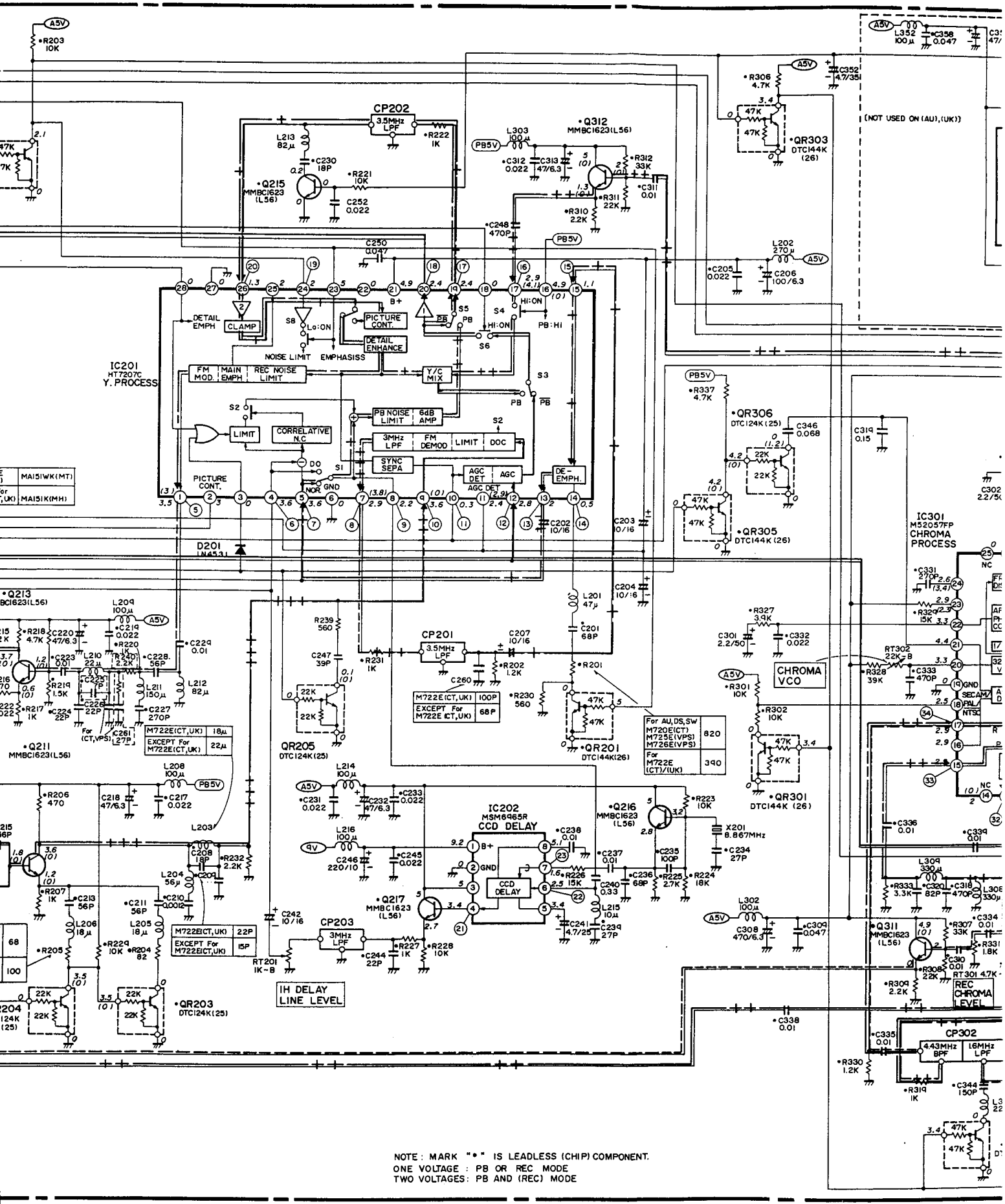


NOTE : MARK "Ⓩ" IS LEADLESS (CHIP) JUMPER.

Y/CHROMA SCHEMATIC DIAGRAM Y/Chroma-Schaltplan



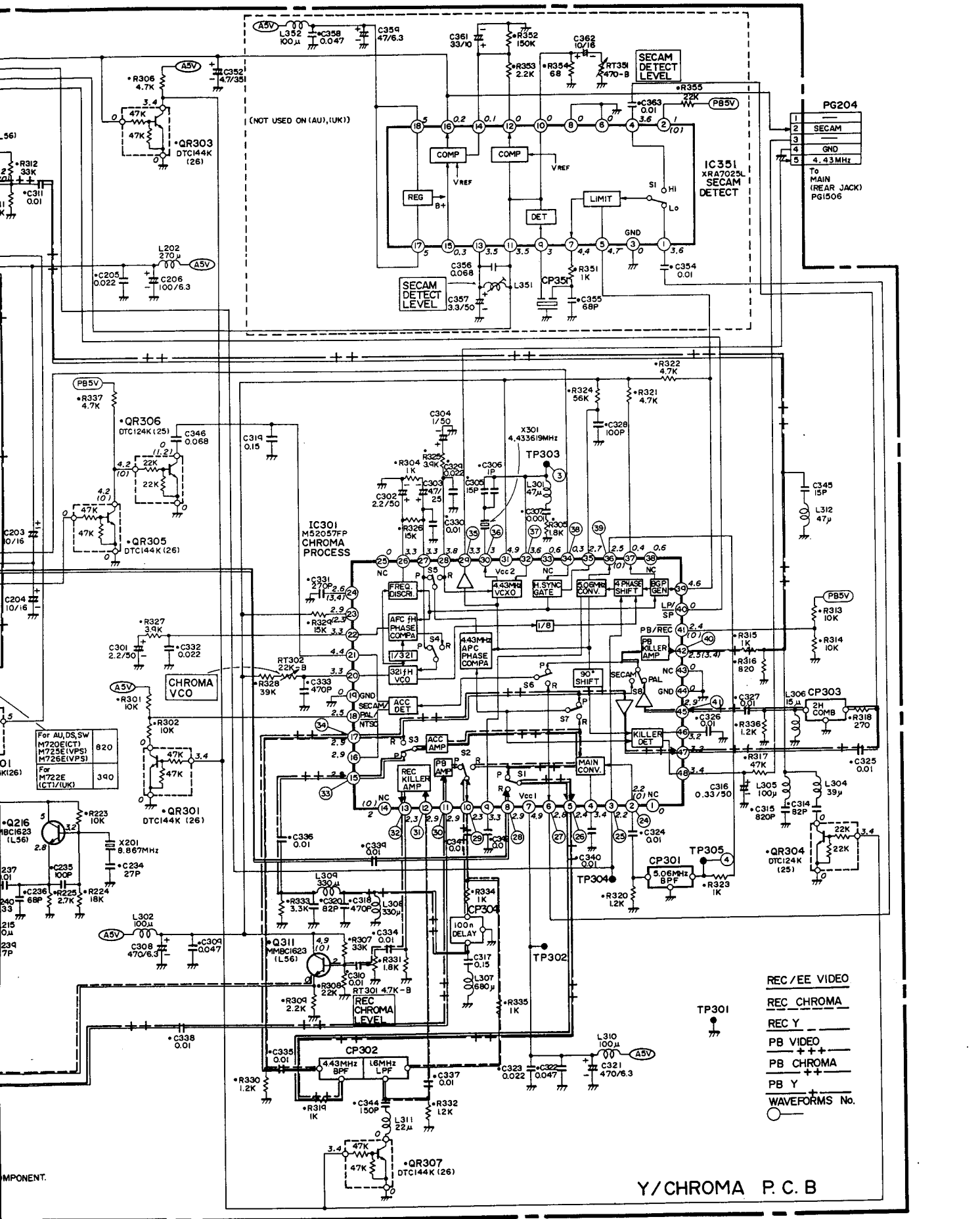
ATIC DIAGRAM Y/Chroma-Schaltplan



NOTE : MARK "•" IS LEADLESS (CHIP) COMPONENT.
ONE VOLTAGE : PB OR REC MODE
TWO VOLTAGES: PB AND (REC) MODE

2 3 4 5

5 – 12 5 – 13


IC351
XRA7025L
SECAM
DETECT
(NOT USED ON (AU), (UK))
PG204
SECAM
GND
4.43MHz
To
MAIN
(REAR JACK)
PG1506
IC301
M52057FP
CHROMA
PROCESS
TP303
TP304
TP305
TP302
TP301
CP301
CP302
CP303
CP304
CHROMA
VCO
REC
CHROMA
LEVEL
SECAM
DETECT
LEVEL
REC/EE VIDEO
REC CHROMA
REC Y
PB VIDEO
PB CHROMA
PB Y
WAVEFORMS No.
Y/CHROMA P. C. B

5 — 13

HITACHI

SERVICE MANUAL

TK | No. 3185E

VT-M720E SERIES

Technical Information

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Manuals related to the VT-M720E series

Name of Manual	Language	Manual No.
Technical Data	English	3183E(UK), 3184E(CT/VPS), 3188(SW, DS/AU)
	German	3186G(CT/VPS)
Technical Information	English	3185E
	German	3187G

VHS

This video deck is a VHS type video recorder. For proper operation, only the VHS type cassette must be used.

SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

VIDEO CASSETTE RECORDER

December 1989 TOKAI WORKS

COMPARISON WITH PREVIOUS MODEL

	ITEM	VT-M720E SERIES	VT-M620E SERIES
FEATURES	HQ (HIGH QUALITY)	USED	*
	TRICK PLAY	VISUAL SEARCH(X5, X9), STILL, F.ADV	*
	AUTOMATIC CONTROL FUNCTION	PLAY, REPEAT, REWIND, REWIND SHUT OFF, OPERATE ON/OFF, EJECT ENDLESS PLAY, INDEX, DIMMER	PLAY, REWIND, REWIND SHUT OFF, OPERATE ON/OFF, EJECT INDEX,
	IR REMOTE CONTROL	LCD & CLOCK (WITHOUT: VT-M727/728)	LCD & CLOCK
	TIMER RECORDING PROGRAMMES	8 PROGRAMMES/1 YEAR	*
	TIMER BACKUP TIME TIMER PROGRAMMED TIME DISPLAY	ABOUT 1 MINUTES START AND STOP SEQUENCIAL	ABOUT 15 MINUTES START AND STOP SIMULTANIOUSLY
	INSTANT RECORDING TIMER (IRT)	CAN SET START TIME	CAN SET START TIME AND LENGTH
	TAPE COUNTER INDICATOR	CLOCK/COUNTER SWITCH	INDEPENDENT
	CHANNEL TUNING FUNCTIONS	VOLT. SYNTHESIZER(UK)	VOLT. SYNTHESIZER(UK) FREQ. SYNTHESIZER(CT)
	EDIT SWITCH	NO	*
	PLAYBACK PICTURE CONTROL	NO	HIGH FREQUENCY CONTROL (BY REMOTE)
	SLOW TRACKING	NO	*
CHASSIS	BASIC CHASSIS TYPE	ZA	PZ
	CYLINDER MOTOR	THREE-PHASE OUTER ROTOR FG: 300Hz	*
	VIDEO HEADS	2 HEADS CH-1/CH-2: 57 µm CONNECTOR TYPE	*
	HEATER	NONE (HEAT SINK USED)	*
	DEW SENSOR	NO	*

* means that the contents are the same as listed in the left column.

	ITEM		VT-M720E SERIES	VT-M620E SERIES
MAIN CONTROL ICs	VIDEO SYSTEM SYSTEM	Y.SIGNAL PROCESS	HT7207C(IC201)	HT4937B(IC201)
		CHROMA SIGNAL PROCESS	M52057FP(IC301)	HES8455C(IC204)
		SECAM DETECTOR	BA7025L(IC351) (CT,VPS,DS)	HES8074A(IC205)
		PRE/REC AMP	BA7252S(IC1P)	BA7212S(IC001)
		1 H DELAY	MSM6965P(IC202)	HN7147B(IC206)

ITEM			VT-M720E SERIES	VT-M620E SERIES
MAIN CONTROL ICs	ON-SCREEN DISPLAY	CHARACTER GEN SYNC SEPARATOR	µPD6450C(IC1401) NO	HES8052(IC1510) *
	AUDIO SYSTEM	REC/PB AMP	LA7297(IC401)	LA7295(IC401)
	JACK	AUDIO INPUT SWITCH VIDEO INPUT SWITCH	M5201L(IC1502) NJM2248 (VT-M727/M728: NO)	*(IC2503) *(IC1502)
	SERVO SYSTEM	SPEED/PHASE CONTROL	HD49747NT(IC601)	BU2745S(IC601)
		CYLINDER MOTOR DRIVE	BA6459P1(IC1651)	LB1684H(IC1651)
		CAPSTAN MOTOR DRIVE	SA2007A(IC1M)	SA2006A(IC01)
		SLOW DRIVER	NO	*
		AUTOTRACKING µP	M50954-422SP(IC901)	NO
	SYSTEM CONTROL	SYSTEM CONTROL µP	CXP50112-110Q(IC751) CPX50116-116Q(IC751)	HD4074008A03S(IC901)
		LOADING MOTOR DRIVE	XRA6209U4(IC753)	BA6209U4(IC902)
	TIMER	TIMER µP	NO(IC751)	M50957-680SP(IC701)CT M50957-679SP(IC701)UK
		EAROM	M6M80021(IC755)	*(IC702)
	CH-TUNING SYSTEM	TUNING INTERFACE	LA7938(IC1501 V.S)	µPC1484CA (IC801,F.S) LA7935(IC801 V.S UK)
	POWER SUPPLY	REGULATOR	RC78M05E(IC851) RC78M12FA(IC852)	STK5372H (IC851)
	VPS(for VPS)	VPS DECODER	HES8052A(IC1504)	SDA5642(IC101)

* means that the contents are the same as listed in the left column.

CHAPTER 1 SERVO CIRCUIT

1-1 General

During recording, the servo system performs the following.

- o Makes the tape run at a fixed speed (SP: 23.39 mm/sec, LP: 11.70 mm/sec), so that the video track has the rated width (SP: 49 µm, LP: 24 µm).
- o Rotates the video heads at 1500 rpm in synchronization with the TV frame frequency (25 frames/sec) in order to record one TV picture field per video track.
- o Rotates the video heads in such a way that the vertical blanking period of the video signal is always recorded at the bottom of each video track in accordance with the VHS standard.

During play, the servo system performs the following.

- o Makes the tape run at exactly the same speed as in recording.
- o Rotates the video heads in synchronization with the TV frame frequency so that they accurately trace the recorded video tracks.

For this purpose, speed control and phase control are applied to the capstan motor that runs the tape and the cylinder motor that rotates the video heads.
The speed control system regulates the motor speed over a wide speed range to maintain the rated speed of the video heads and tape. The phase control system fine adjusts the position of video heads and video tracks within narrow limited ranges.
Fig. 1-1 shows the configuration of the servo circuit. Table 1-1 shows the reference and comparison signals used for servo control.
The servo circuits consist of the following ICs.

IC601: Controls the phase and speed of rotation of the capstan and cylinder motors, produces head switching signals, and changes the capstan motor speed.

IC602: Amplifies the capstan FG signal and shapes the signal into a square wave.

IC1651:Cylinder motor driver.

IC01: Capstan motor driver.

Table 1-1 Reference and Comparison Signals

Motor	Control System	Mode	Reference Signal	Comparison Signal
Cylinder	Phase	REC	1/2 V. SYNC	Tach pulse (TACH PULSE: 25 Hz)
		PB	REF25Hz	
	Speed	REC/PB		Cylinder FG (CYL. FG: 300 Hz)
Capstan	Phase	REC	REF25.2Hz	Capstan FG (C. FG: 25.2Hz)
		PB	REF25Hz	Control pulse (CTL PULSE: 25 Hz)
	Speed	REC/PB		Capstan FG (C. FG) (SP: 504 Hz, LP: 252Hz)

IC601 contains the major part of the servo system and uses digital techniques to control the servo system.
The digital servo system uses digital counters that produce digital error data representing speed/phase errors. The error data is converted to a DC voltage by a digital-to-analogue converter which regulates the speed of the motor. (In the previous models, the error data was first converted to a PWM signal and then converted to a motor speed control DC signal.)

When the speed or phase is slow or delayed, the error counter detects a higher digital value and the D/A converter stage enhances the motor speed control DC signal to advance the phase or to make the speed faster. When the speed or phase is fast or advanced, the error counter and the D/A converter lowers the motor speed control DC voltage.
When compared with the previous servo system using the PWM system, as lowpass filters can be eliminated, the number of parts can be reduced in this servo system.

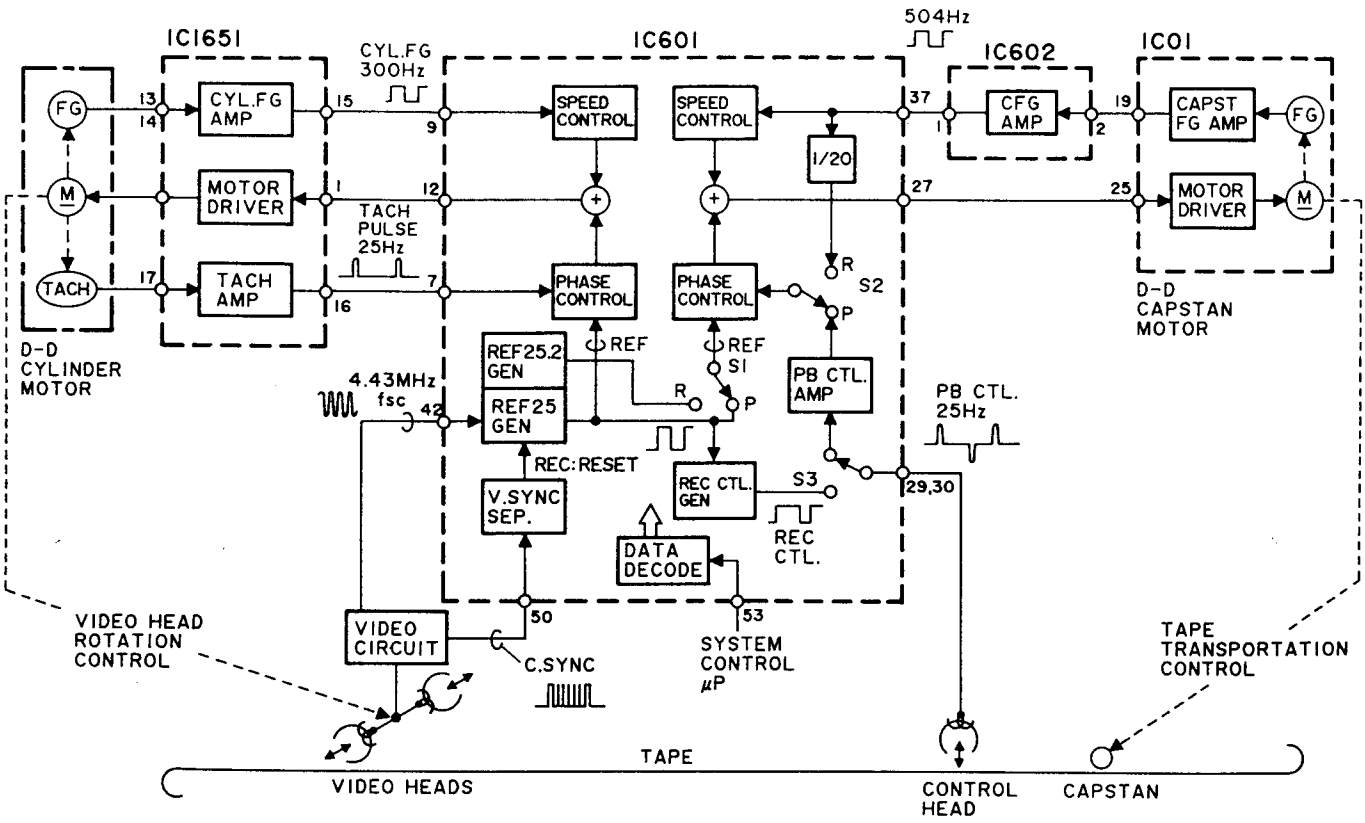

Fig. 1-1 Configuration of Servo Circuit

1-2 Reference and Comparison signals

REF25Hz
The reference signal REF25Hz used in the cylinder and capstan phase control systems is obtained in the REF25Hz generator stage by dividing the 4.43 MHz signal produced inside the chroma signal processor to 25 Hz. The reference signal REF25.2Hz used for capstan phase control in recording is also obtained by dividing the 4.43 MHz by 175744.
During recording, the REF25Hz generator is reset with the vertical sync signal (V. SYNC) to synchronize the REF25Hz signal with the vertical sync signal.

TACH pulse
The TACH pulse is produced by the tach head provided on the cylinder motor base plate. When the tach magnet installed on the rotor magnet of the lower cylinder passes the tach head, the TACK pulse is generated. When the cylinder motor is rotating at the rated speed (1500 rpm), the TACH pulse frequency is 25 Hz. The TACH pulse is used as the comparison signal in the cylinder phase control system.

Cylinder FG (CYL. FG)
The CYL. FG signal is produced by the FG coil printed on the cylinder motor base plate when the rotor magnet of the lower cylinder rotates, and indicates the cylinder motor speed.
When the cylinder motor is running at the rated speed (1500 rpm), the cylinder FG (CYL. FG) frequency is 300 Hz.

Capstan FG (C. FG)
The capstan FG signal is produced by the FG head (composed of variable resistors sensitive to magnetism) installed on the capstan motor base plate when the FG magnets fitted on the circumference of the rotor of the capstan motor rotate. It represents the capstan motor speed, and when the capstan motor is driving the tape at the rated speed (SP: 23.39 mm/sec, LP: 11.70 mm/sec), the capstan FG (C. FG) frequency is as follows.

Table 1-2 Capstan FG frequency

Mode Tape speed	Record/play (Hz)	Search (Hz)
SP	504	2520 (x 5)
LP	252	2268 (x 9)

C. FG is also used as the comparison signal during recording by the capstan phase control system.
C. FG is divided by 20 during SP and by 10 during LP, to 25.2Hz, and is compared with REF25.2Hz for phase control.

Control pulse (CTL pulse)
During recording, REF25Hz is triggered by the vertical sync signal and is shaped into a square wave having a duty ratio of 60%
and then recorded on the control track by the control head. During play, the control head picks up the playback control pulse from the control track. This control signal is used as the comparison signal by the capstan phase control system. When the capstan motor is driving the tape at the rated speed, the playback control (CTL) pulse frequency is as follows:

Table 1-3 CTL pulse frequency

Mode Tape speed	Normal play (Hz)	Search (Hz)
SP	25	125 (x 5)
LP	25	225 (x 9)

Capstan FG amp: IC602
The C. FG signal (0.7 Vp-p) is amplified and shaped into a square wave (4.5 Vp-p) by IC602 before it is sent to the capstan speed/phase control systems in IC601. This is performed to prevent malfunctioning of the systems caused by waveform distortion and noise superimposed on the signal.

1-3 Digital to Analogue Converter

In this uit, to make the response speed of the servo circuit faster and to reduce the number of parts used in lowpass filters, D/A converters are used instead of the PWM circuits used in the previous models.

Fig.1-2 shows the principle of digital-to-analogue conversion.
The speed error counter generates 11-bit speed error data and sends it to the D/A conversion counter, and the data is stored in the counter.
After storing the data to be converted to an analogue voltage, the D/A conversion counter turns switch S1 on untill the reading becomes equal to the stored data (from t3 to t4). While S1 is turned on, a constant current I1 is charged to capacitor C1, and the output of operational amplifier A1 increases as shown Fig. (e). Thus an analogue DC voltage V1 which is proportional to the digital data is generated at the output of the operational amplifier at t4. As switch S3 turns on at t5, the analogue DC voltage chargees capacitor C2 and the DC voltage generated by C2 is held until the next sampling is performed. At t7 when the FG signal falls to zero, the next D/A conversion starts. When it reaches t8, next digital data is set to the D/A conversion counter and S2 turns on. As a result, C1 dischares through S2 and the output of A1 falls to zero, A1 starts to generate the next analogue DC voltage from t9.
The D/A converted DC voltage generated by C1 is output to the motor.

When the motor is running at the rated speed or phase, the output of the D/A converter is 2.5 VDC.

In this system, because the lowpass filter time constant can be reduced, servo response is quicker. Differences in the cylinder and capstan control systems are summarized below.

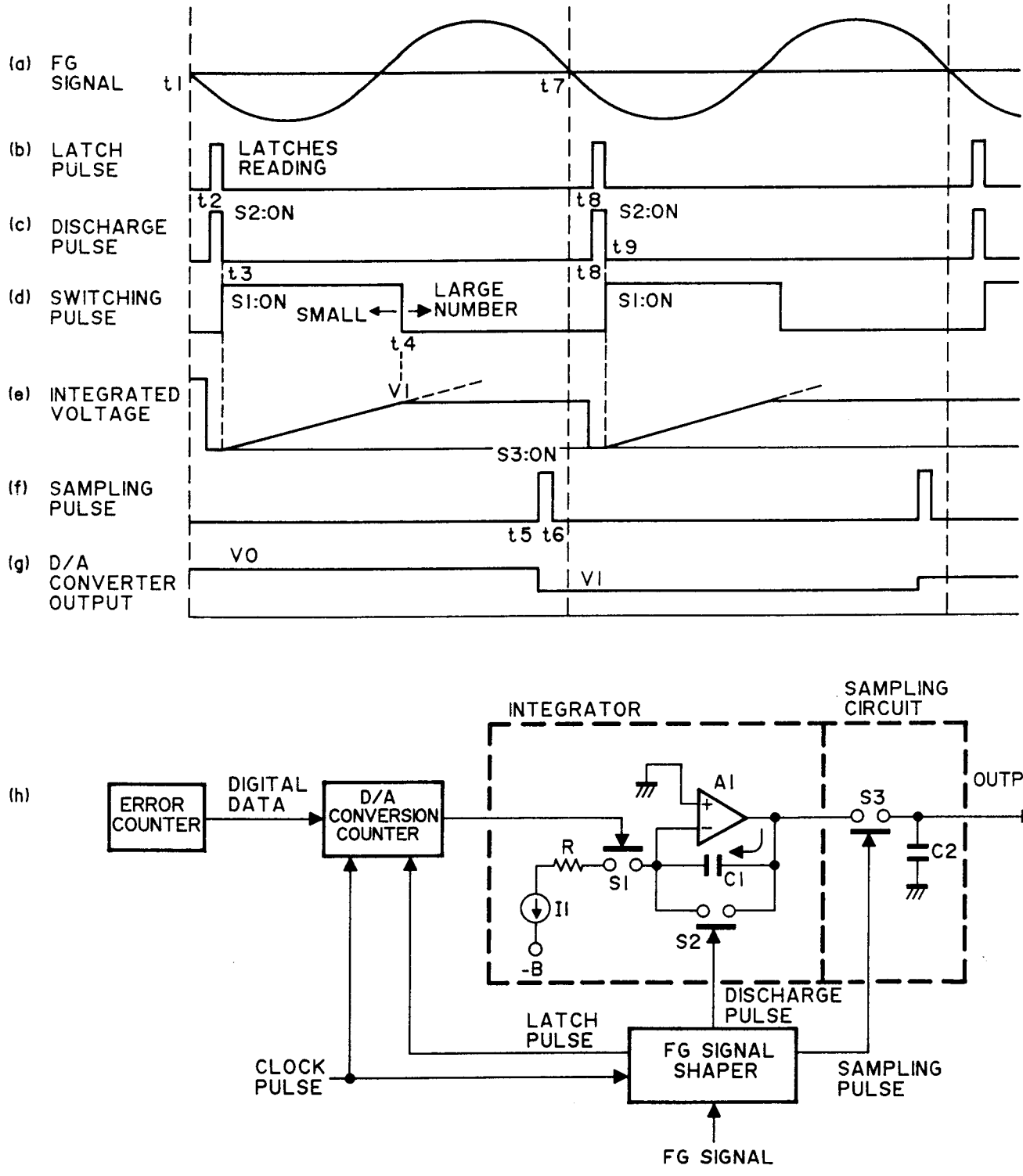

Fig. 1-2 Digital to Analogue (D/A) converter

1-4 Configuration of Cylinder Servo Circuit

Fig. 1-3 shows the configuration of the cylinder servo circuit.
The speed and phase of the cylinder motor are controlled by the servo IC (IC601). The CYL. FG signal is fed back to the speed control loop and the TACH pulse is fed back to the phase control loop. The reference signal REF25Hz for the cylinder phase control loop is triggered by the vertical sync and is sychronized with the vertical sync during recording so it differs from the REF25.2Hz for capstant phase control. During play REF25Hz is used in common by the cylinder and capstan phase control loops.
The digital error data of the phase and speed control loops are converted to the phase (2.5 VDC at pin 17) and speed (2.5 VDC at pin 14) control DC signals and added together to form a cylinder motor control voltage (2.6 VDC at pin 12). After that, the cylinder motor control signal enters the cylinder motor driver (IC1651) which controls the drive current (30 mVDC at pin 8) to be supplied to the 3-phase DD cylinder motor drive coil to maintain the rated cylinder motor (video heads) speed.
Thus the cylinder motor (video heads) rotates at the rated speed while keeping in synchronization with the recording video signal during recording and it rotates in synchronization with the capstan motor rotation during play.

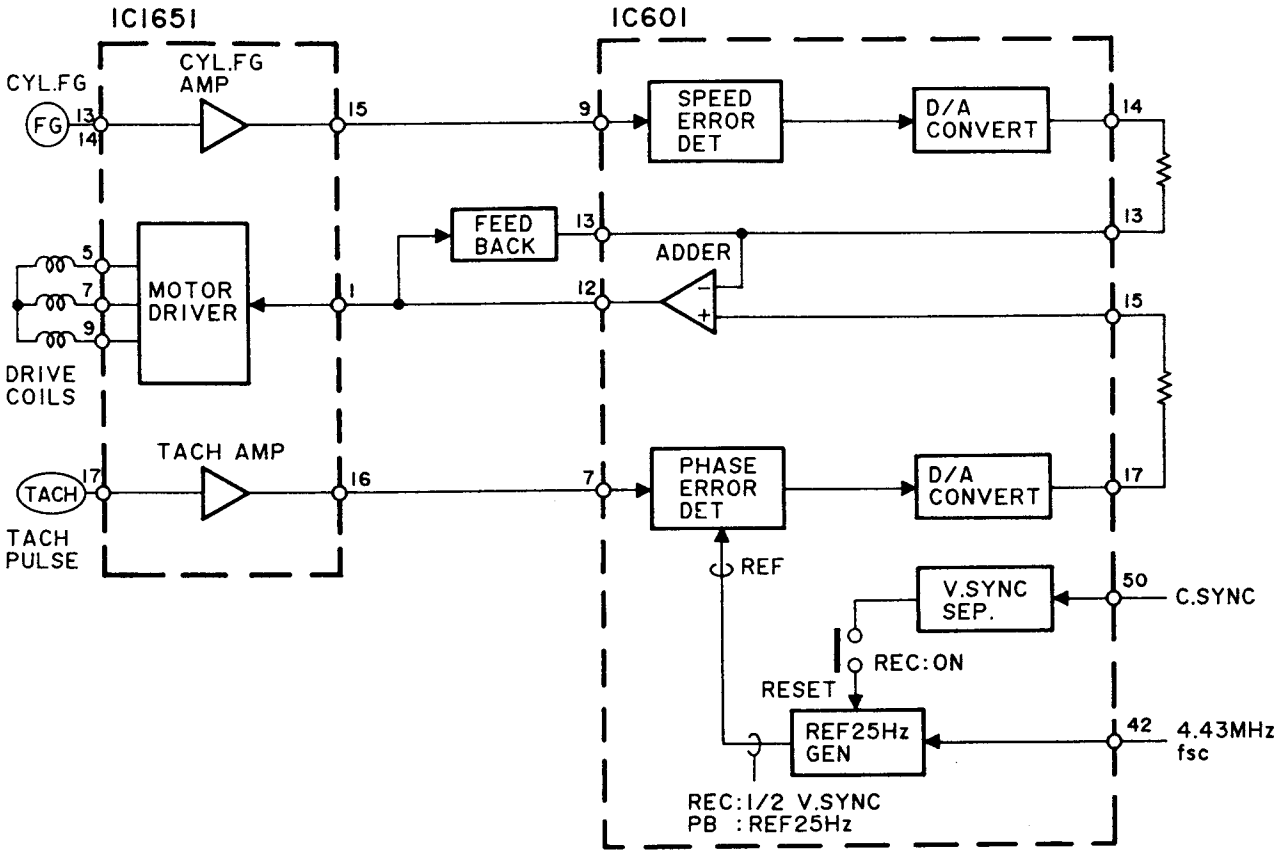

Fig. 1-3 Cylinder Servo Ciruit

1-5 Cylinder Speed Control

Fig. 1-4 shows the cylinder speed control circuit. The cylinder speed control system maintains the rated speed of the cylinder motor.
The CYL. FG produced by the cylinder FG coil located on the cylinder motor printed circuit boad is shaped into a square wave of 300 Hz by a waveshaping circuit in cylinder motor driver IC1651 and then supplied to the speed error detector (SPEED ERROR DET) in IC601 via pin 9 (3.5 Vp-p).
The speed error detector which consists of a digital counter (11 bits) measures the period of CYL. FG, using a 739 kHz clock signal produced from the 4.43 MHz signal by division by 6. The speed error detection counter is formed so that the counter reading falls to the center value (1024) of the counting range when the speed is nominal. The speed error detection counter latches error data at the fall of the CYL. FG pulse and sends the data to the D/A converter.

- When the speed of the cylinder motor is 1500 rpm, the latched data is the center value 100 0000 0000 and the D/A converter produces the rated control voltage 2.5 VDC.

- When the speed rises above 1500 rpm, the latched data is less than the center value 100 0000 0000 and the error control voltage will be lowered to lower the speed.
- When the speed falls below 1500 rpm, the error control voltage will be raised to increase the speed.

The speed control DC voltage produced in this way is output via pin 14 and is applied to the adder via pin 13 (2.5 VDC). The adder adds the speed control signal and the phase control DC signal supplied from the cylinder phase control system, and the summed output is applied to the cylinder motor driver (IC1651: CYL. DRIVER) via pin 12.
The LPF (C602, R604 and C614) which removes ripple contained in the control signal.

The cylinder motor driver, receiving 3-phase information indicating the position of the rotor via pins 19-24, controls the current supplied to the 3-phase drive coil connected to pins 5, 7 and 9 in such a way that the magnetic field produced attracts/repels the rotor magnet, that is a rotating magnetic field is generated. As the torque produced by the rotating magnetic field is proportional to the motor drive current, the speed of rotation depends on the speed/phase error voltage applied via pin 1.
S1 and AMP1 form an overcurrent protection circuit. The amount of drive current flowing through the 3-phase drive coil can be measured by monitoring the voltage appearing across R1654/R1655 (30 mVDC in playback, 10 mVDC in the stop mode). AMP1 compares the voltage with the reference voltage, and if the voltage across R1654/R1655 is higher than the reference voltage, it considers the current to be excessive (1.3 A) and switches off S1.

Correcting fH during trick play modes
In trick play, since the tape speed differs from the normal speed, the relative speed between the tape and video heads varies. This variation of relative speed causes the horizontal sync frequency (fH) to be shifted, leading to skewing of the image. To correct this, the speed error detector shifts the cylinder motor speed so that the horizontal sync frequency is as rated in the trick play mode. This is actually performed by varying the point at which data counting with the speed counter is started. Table 1-4 shows the cylinder speed in the trick play mode.

Table 1-4 Cylinder Speed

Mode	Tape speed	CYL. FG frequency (Hz)	Cylinder motor rpm (rpm)
Record, play, record pause	SP/LP	300	1500
Still, slow, frame advance	SP LP	298 299	1492 1496
Forward search	SP LP	306 306	1529 1529
Reverse search	SP LP	291 293	1457 1464

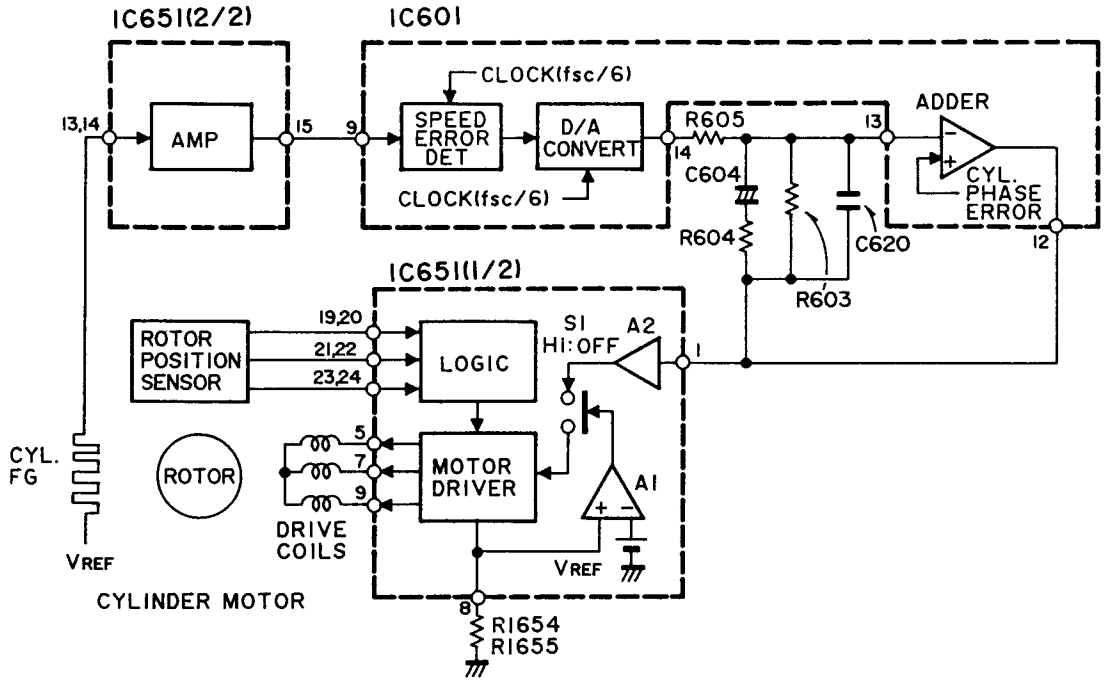

Fig. 1-4 Cylinder Speed Control Circuit

1-6 Cylinder Phase Control

Fig. 1-5 shows the cylinder phase control circuit.
The cylinder phase control system starts to work after the cylinder speed has reached the rated speed (1500 rpm). It performs control so that the vertical blanking period of the video signal to be recorded is aligned at the bottom edge of the tape during recording and that the recorded tracks are traced accurately during play.
The phase of the video heads (cylinder motor) rotation is controlled by the output of the cylinder phase detector.

When the phase of the video heads (cylinder) is the same as the reference phase, the output of the phase detector (D/A converter) is 2.5 VDC. To detects the phase error between the cylinder and the reference phases, the phase control circuitry compares the phase of the TACH pulse with REF25Hz triggerd by the V. SYNC signal extracted from the video signal to be recorded during recording. During playback, it compares the TACH pulse phase with the REF25Hz signal (free running) that is used in common as the reference phase for capstan and cylinder control.

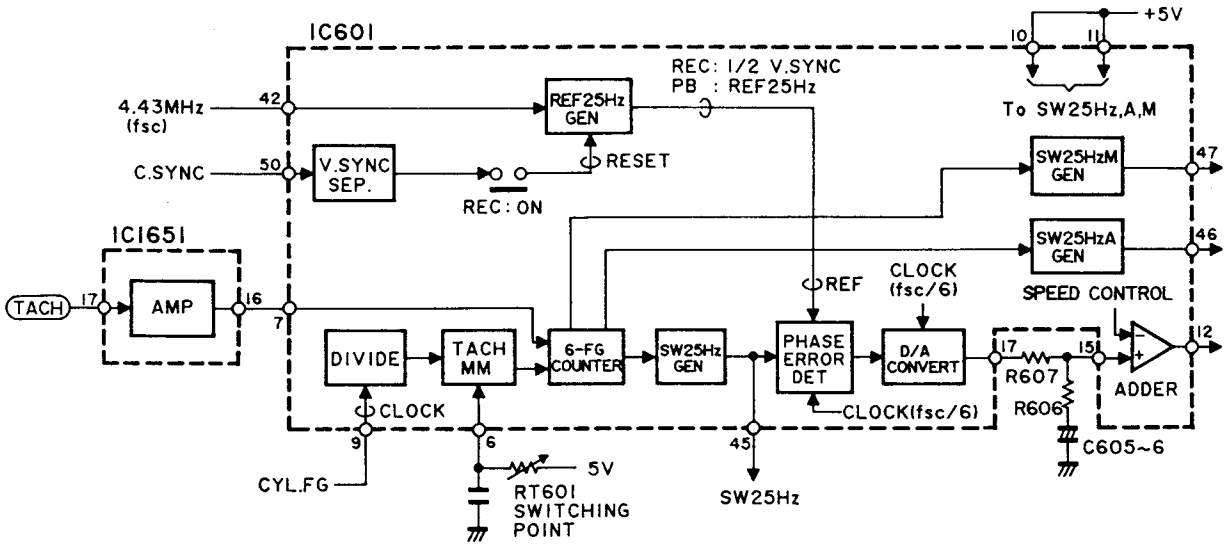

Fig. 1-5 Cylinder Phase Control Circuit

1) Generation of SW25Hz head switching signal

Fig. 1-6 shows the generation of the head switching pulse.
SW25Hz is produced from the TACH pulse and cylinder FG signal.
The TACH pulse generated by the TACH head is amplified by an amplifier in IC1651 and applied to the reset input of the 6-CYL. FG counter in IC601 via pin 7 (2.3 Vp-p).
The frequency of the CYL. FG pulse is 300 Hz and the period of the TACH pulse is 12 times as long as that of the CYL. FG pulse.
The cylinder FG signal applied via pin 9 (300 Hz, 3.5 Vp-p) is first divided by the 2-divider to become a 150 Hz FG signal. The TACH shift monostable multivibrator delays the phase of 150 Hz FG signal as shown Fig. 1-6 (d) and the applies it to the 6-cylinder FG counter.
The CYL. FG counter counts CYL. FG pulses and outputs trigger pulses to the SW25Hz generator (flip-flop) when the counter reading reaches 1 and 4 to produce the switching pulse SW25Hz.
The tach pulse is used to reset the reading of the 6-FG counter to zero.
The first and forth CYL. FG pulses indicate two positions which are close to the video heads and are accurately 180° apart from each other.
The trailing and leading edges of the SW25Hz must coincide with the rotation phase of the video heads.
Due to fabrication errors, the timing of the tach pulse phase gets out of position. The the tach monostable multivibrator (TACH MM) compensates for physical fabrication errors between the FG magnet, FG coil and video heads.
The tach monostable multivibrator sets the leading and trailing edges of the SW25Hz at 6.5H ahead of the vertical sync signal with RT601.
The SW25Hz signal produced in this way is output via pin 45 as the head switching pulse and, at the same time, supplied to the cylinder phase error detector (PHASE ERROR DET) for comparison with the reference signal.

When the reading of the 6-FG counter is 2, 5; 3 and 6, a trigger pulse is applied to SW25HzA or SW25HzM switching pulse generator to generate the SW25HzA and SW25HzM switching pulses. SW25HzA can be used to select the output of the Hi-Fi audio heads, and SW25HzM can be used to select the output of the exclusive LP video heads used in the 4-video heads system.

The polarity of head switching pulses SW25Hz, SW25Hza and SW25HzM can be switched by the digital data applied to pins 9 and 10. In this unit logic high is applied to pins 9 and 10, and the switching pulse generators output the switching pulses with the polarity shown Fig. 1-6 (e), (f) and (g).

2) Phase comparison

During recording, the REF25Hz signal has the same phase as V. SYNC since the REF25Hz generator is reset with the vertical sync signal (V. SYNC) of the video signal.
The phase error detector which consists of a digital counter counts the time difference between the SW25Hz and reference signal in reference to the 1108 kHz clock signal produced from the 4.43 Hz carrier signal. The 11-bit phase error data is converted to an analogue DC voltage by the DA converter.

- o When the phase of cylinder motor rotation is correct, the output of D/A converter is 2.5 VDC.
- o When the phase of cylinder motor rotation is advanced, the data of the error counter becomes lower and the output of the D/A converter is lowered to correct the rotation phase.
- o When the phase of cylinder motor rotation is delayed, the output of the D/A converter is raised.

In the following cases, the output of the phase detector is always set to 2.5 VDC.

- o The frequency of CYL. FG is more than +5% from the rated value.
- o In the trick play modes (search, still).

In the fast-forward, rewind and stop modes, the output of the phase detector is fixed to "Lo" level to stop the cylinder motor.
The cylinder phase control DC signal passes through pin 17 (2.5 VDC) and enters an LPF (R605, R606, C605 and C606), which smooths the control signal. The cylinder phase control signal is then added to the speed control DC signal.

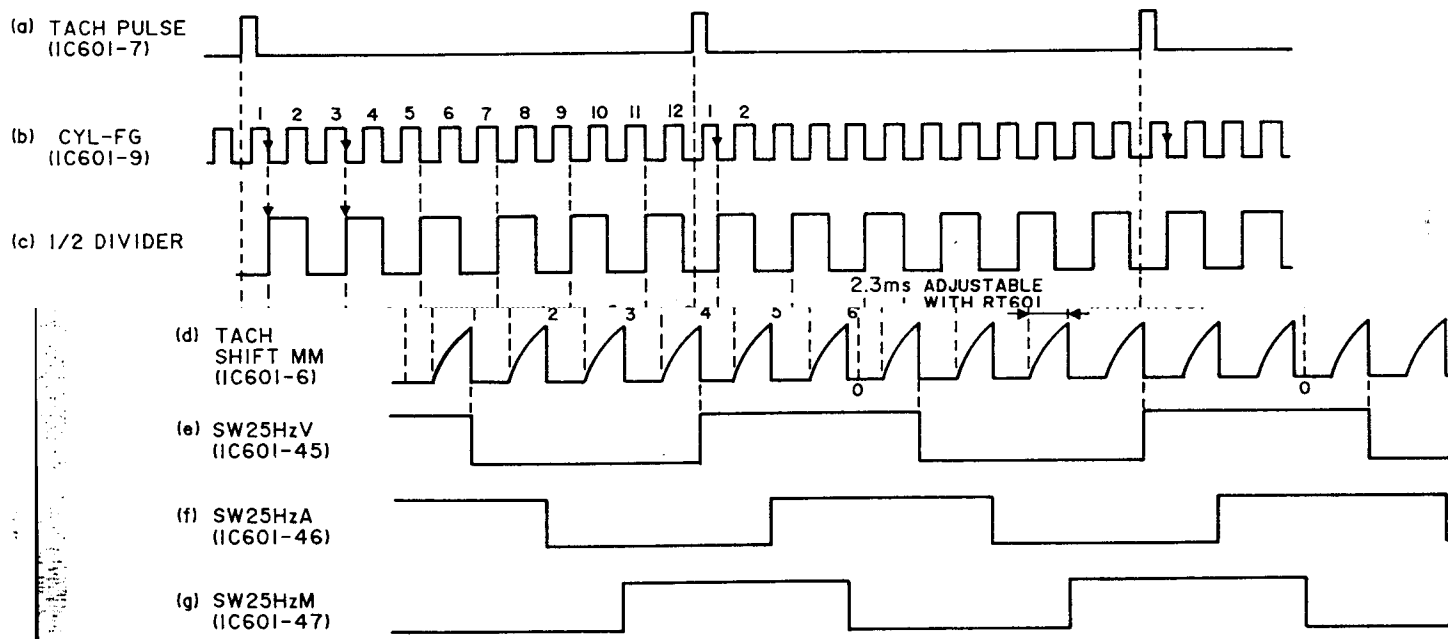
(a) TACH PULSE (IC601-7)
(b) CYL-FG (IC601-9)
(c) 1/2 DIVIDER
(d) TACH SHIFT MM (IC601-6)
(e) SW25HzV (IC601-45)
(f) SW25HzA (IC601-46)
(g) SW25HzM (IC601-47)
1 2 3 4 5 6 7 8 9 10 11 12 1 2
2.3ms ADJUSTABLE WITH RT601

Fig. 1-6 Generation of Head Switching Pulse (SW25Hz)

1-7 Configuration of Capstan Servo Circuit

Fig. 1-7 shows the configuration of the capstan servo circuit.
The servo IC (IC601) performs speed/phase control of the capstan motor. The C. FG signal is used as the comparison signal in the capstan speed control loop. The C. FG signal is also used as the comparison signal in the capstan phase control loop during recording while the CTL pulse is used during play.

The reference signal of the phase control loop for recording differs from that for play. The frequency of REF25.2Hz signa for recording is 25.2266Hz to exactly match the frequency of the C.FG25.2Hz obtained by dividing the C. FG by 20 (SP mode). In playback, REF25Hz is used the capstan phase control loop just as the cylinder phase control loop.

Error digital data in the speed and ph loops are D/A-converted and then added together to become the capstan motor speed control voltage (2.5 VDC at pin 27). This enters the capstan motor driver (built into the capstan motor). The speed of capstan motor rotation (t travel speed) is kept at the rated val

by controlling the current (130 mA) supplied to the drive coil of the 3-phase direct drive (DD) capstan motor.

As a result, the capstan motor runs at the rated speed during recording and during play.

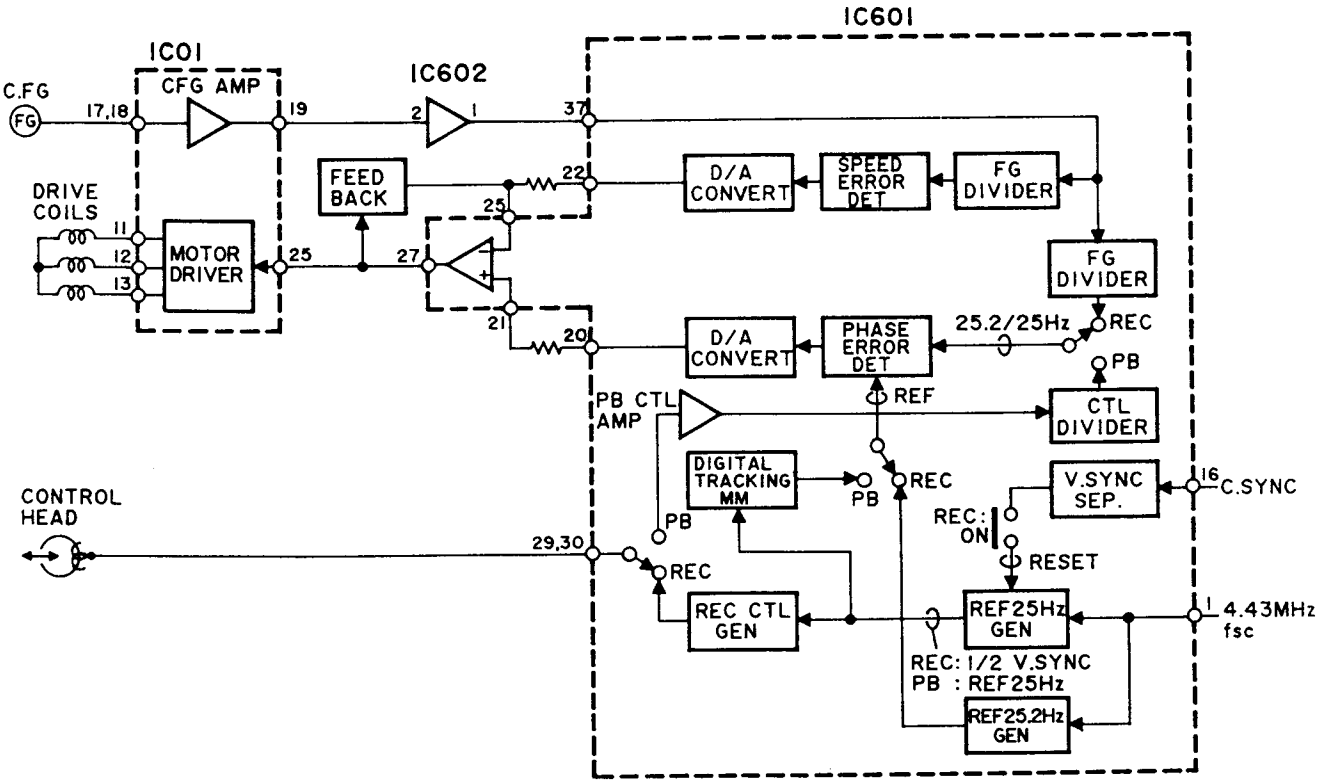

Fig. 1-7 Capstan Servo Circuit

1-8 Capstan Speed Control

Fig. 1-8 shows the capastan speed control circuit.
The capstan speed control system keeps the tape speed as follows:

- o Record/play : SP, 23.39 mm/sec; LP, 11.70 mm/sec
- o Search : SP, 5 times faster; LP, 9 times faster
- o Fast-forward/rewind : 10 times the SP speed.

The speed control circuit monitors the period of the C. FG signal to perform the above control.
The C. FG signal (0.7 Vp-p, 504 Hz) from the capstan motor is shaped into a square wave (4.5 Vp-p) by a waveshaping circuit in IC602 and sent to the C. FG divider (C. FG DIVIDER) in IC601.
The frequency of the C. FG pulse which varies with the tape speed must be kept constant. This is performed by switching the division ratio at the C. FG divider according to the tape speed. Division by 2 is done in the SP mode and no division is done in the LP mode. Division by 5 is done in the SP search modes, by 9 in the LP search mode, and by 10 in the fast-forward/rewind modes. The output of the divider is supplied to the speed error detector (SPEED ERROR DET). The speed error detector which consists of a digital counter counts the period of the C. FG pulse in reference to the 1108 kHz clock signal produced from the 4.43 MHz signal by division by 4, and converts the error data into a 11-bit data the centre value of which is 1024, which will be supplied to the D/A converter. The output of D/A converter is fixed to "Lo" in the still and stop modes.
The DC speed control signal converted from the error data passes through pins 22 and 25 (2.5 VDC) and enters

the operational amplifier, where it is added to the phase control DC signal from the capstan phase control system.
The added speed control DC signal passes through pin 27 (2.5 VDC) and enters the capstan motor driver (IC01: CAPST. DRIVER). The negative feedback circuit provided between pins 27 and 25 forms a lowpass filter and smooths the ripple attributed to sampling.
The output voltage at pin 27 is: normal playback and recording, 2.5 VDC: fast forward and rewind, 2.65 VDC; forward and reverse search, 2.6 VDC; recording pause, 4.6 VDC.
In the recording pause mode, as Q601 is turned on by the system control μP, the speed control voltage applied to the capstan motor is reduced to 1.3 VDC and the motor is stopped.

The capstan motor driver, receiving a 3-phase signal indicating the position of the rotor via pins 29-30 and 1-4, switches the direction of the current supplied to the 3-phase drive coil connected to pins 11-13 to produce a rotating magnetic field. The rotating magnetic field repels/attracts the rotor magnet to turn it. The direction of the rotating magnetic field is determined by the voltage level applied to pin 27. When "Hi" is applied to pin 27, the capstan motor rotates in reverse so the tape runs backward.

The drive current flowing through the capstan motor can be measured at pin 7 (1.2-ohm resistor) as a voltage and is: play and recording, 160 mVDC; fast forward and rewind, 190 mVDC; forward and reverse search, 230 mVDC; stop and pause, 7 mVDC.

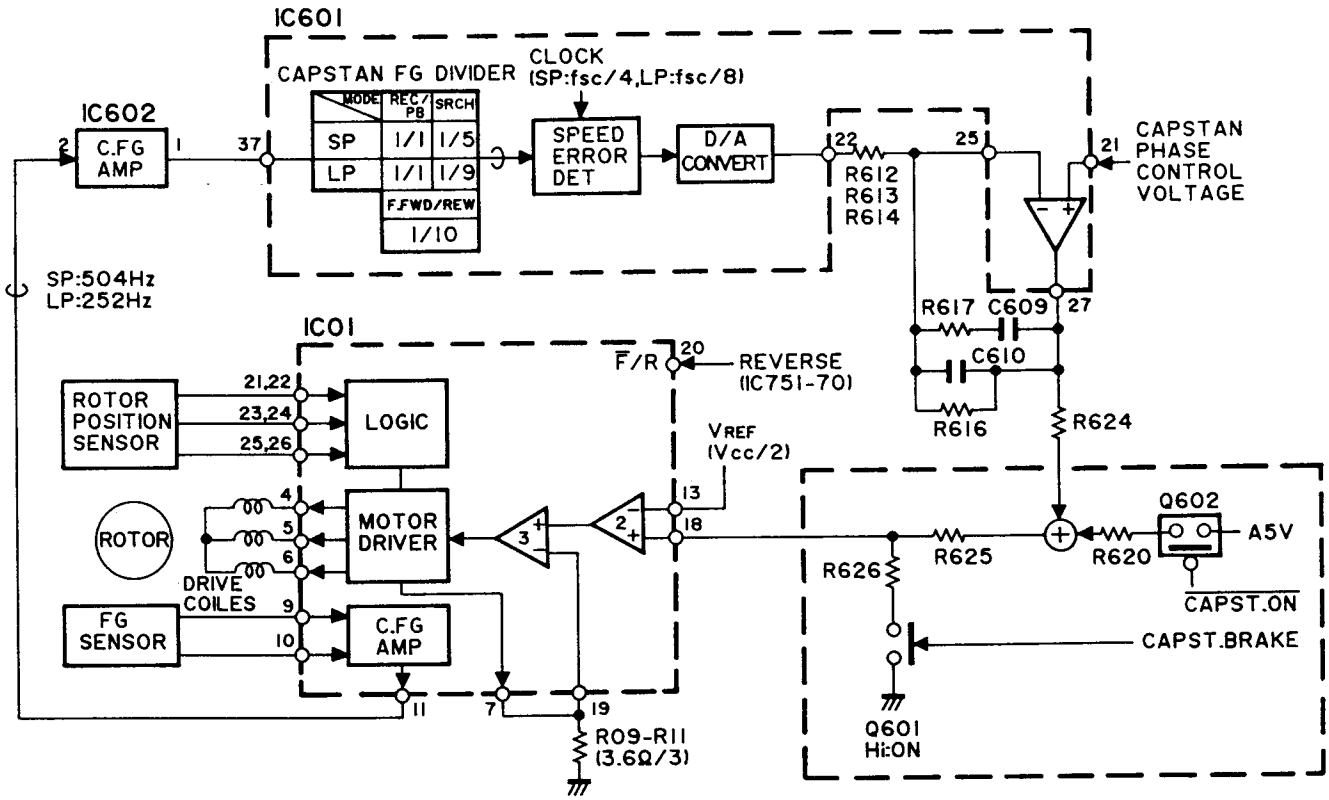

Fig. 1-8 Capstan Speed Control Circuit

1-9 Capstan Phase Control

Fig. 1-9 shows the capstan phase control circuit
The capstan phase control system starts to work when the speed control system has established the rated speed of the capstan motor. During recording, it works together with the speed control system to maintain the rated tape speed.

During play, it controls tape travel so that the video heads can trace the recorded tracks accurately.
The phase of the capstan motor rotation is controlled by the phase control DC voltage. When the phase of the comparison signal coincides with the reference phase, the phase control DC voltage is 2.5 VDC. The deviation from the reference phase is detected by a digital counter and is converted to the phase control DC

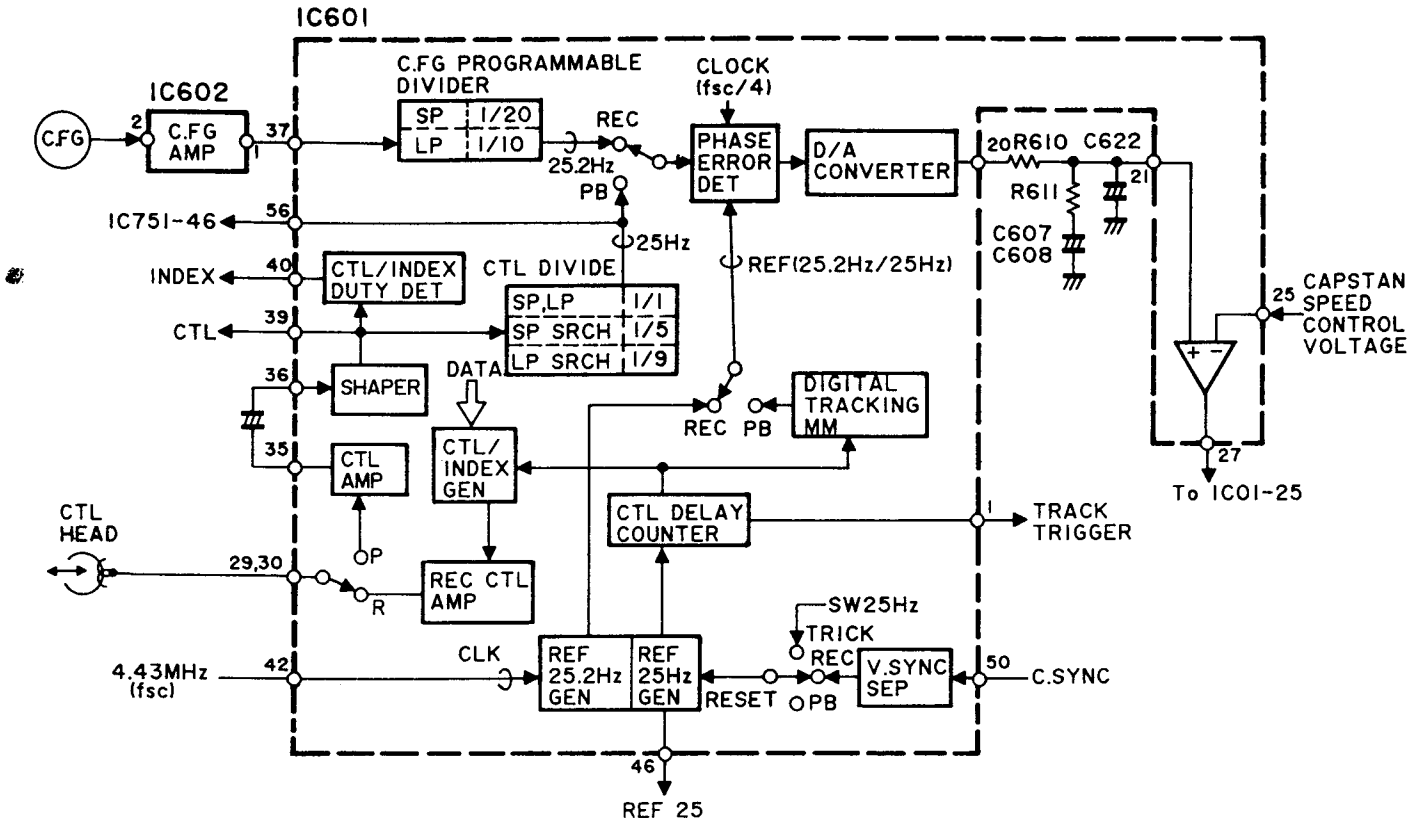

Fig. 1-9 Capstan Phase Control Circuit

voltage. To perform this control, the phase control circuit compares the C. FG pulse with REF25.2Hz during recording, and the CTL pulse with REF25Hz during play.

1) Operation during recording

The 504Hz C. FG signal (SP mode) from the capstan motor is shaped into a square wave by a waveshaping circuit (SHAPER) in IC602 and sent to the C. FG divider (C. FG DIVIDER) in IC601.

The frequency of the C. FG pulse which varies with the tape speed must be kept constant. The C. FG divider divides the C. FG pulse by 20 for the SP mode and divides by 10 for the LP mode to produce the C. FG25.2HZ (accurately 25.2277Hz). C. FG25.2Hz is supplied to the capstan phase detector. The phase detector which consists of a digital counter counts the time difference between C. FG 25.2Hz and REF 25.2Hz in reference to the 554 kHz clock signal produced from the 4.43 MHz signal by division by 8. The phase detector generates 11-bit data indicating the time difference and supplies it to the D/A converter.

The D/A converter converts the 11-bit phase error data to the phase control DC voltage. The output of the D/A converter is 2.5 VDC if there is no phase error.

The capstan phase error control DC signal passes pins 20 and 21 (2.5 VDC) and enters the adder stage, where it is added to the speed control DC signal supplied from the capstan speed control system. The lowpass filter (R610, R611, C622 and C608) smooths the ripple caused by sampling and specifies the frequency response of the phase control loop. After this, the operation of the circuit is the same as in the speed control system.

2) Recording CTL (control) signal

As the REF25Hz generator is reset by the 25 Hz vertical sync signal during recording, the REF25Hz signal has the same phase as the vertical sync signal. The CTL delay stage delays the REF25Hz by 20ms to make the CTL recording signal in phase with the vertical sync signal. (In models whose x value is not rated value, such as models provided with two double azimuth heads, the delay time required to record the CTL signal at the position specified by the VHS standard is not 20ms.)

The recording CTL/Index pulse generator (CTL/INDEX GEN) shapes the REF25Hz signal to a square wave with a duty ratio of 60%. This pulse signal is recorded on the tape's control track by the control

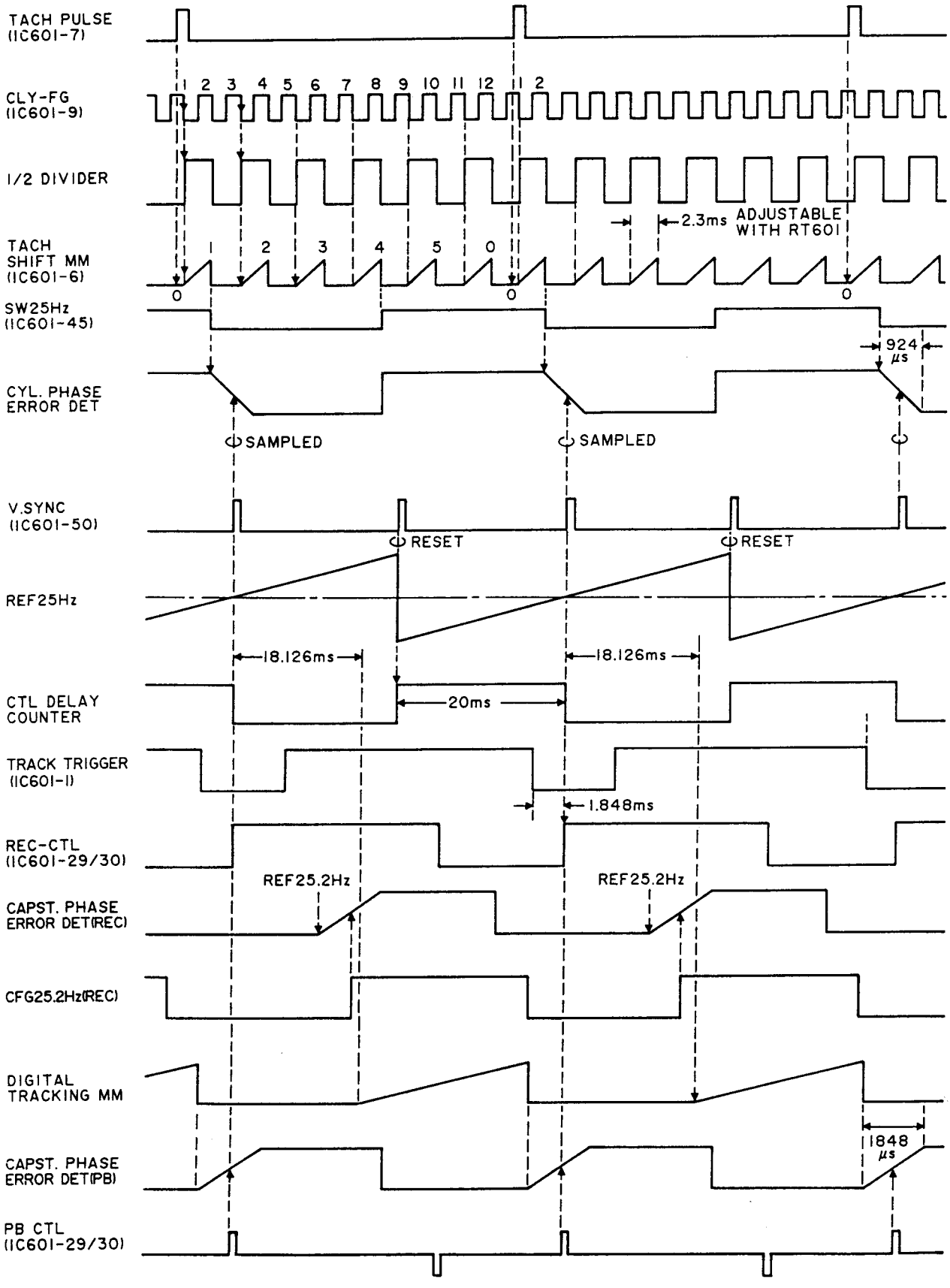

Fig. 1-10 Timing of Phase Control

head as the video track identification signal. During play, it will be compared with the reference signal in the capstan phase control system.
When an index recording command (bits 15, 14 and 13 of the serial data is 1 1 0) is instructed via the serial command input port (pin 53), the CTL/Index generator stage sets the duty ratio of the recording CTL signal to 27.5% and outputs it as 64 counts to record an index signal.
The recording amp outputs a 4 Vp-p and a 2.5 Vp-p 25 Hz CTL recording signal via pins 29 and 30.

3) Operation during play
The playback CTL pulse signal is compared with REF25Hz to control tape travel so that the video heads accurately trace the recorded tracks. As the CTL pulse is 25 Hz regardless of the tape speed, no division is necessary.
The phase of the REF25Hz signal can be adjusted manually during play using the remote control hand unit. The purpose of phase adjustment is to assure optimum tracking to obtain maximum playback output from the video heads.
This adjustment can be done by pressing the tracking up/down buttons provided on the remote control hand unit. The tracking up/down command is transferred to the digital tracking MM via the system control µP, pin 53 of the servo IC and data decoder stage. When the tracking up/down switches are pressed, the delay time of the tracking counter varies from -12.9 ms to + 13.4 ms in a range of 57 steps

4) Operation in search mode
In the search mode, the frequency of the CTL pulse varies with tape speed (SP: 5 times faster, LP: 9 times faster). However the comparison signal for the phase detector must be constant in all cases. Therefore the CTL frequency will be converted to 25 Hz by division by 5 in the SP search mode and by 9 in the LP search mode.
The reference signal, REF25Hz, is reset by the SW25Hz signal in the search mode. This is because the speed of the cylinder motor is shifted as shown on Table 1-4 in order to maintain the relative speed between the tape and video heads and to obtain the rated horizontal sync frequency at each tape speed. This is equivalent to bringing the CTL pulse in phase with the TACH pulse. Eventually the noise band will be fixed on the screen.

5) Fixing phase control DC output
In the following cases, the phase control system stops working and the phase control DC output is set to 2.5 VDC.
o The frequency of CYL. FG is more than ±10% away from the rated value.
o The frequency of C. FG is more than ±5% away from the rated value.
o CTL pulse cannot be detected.
o In fast-forward, rewind.
In the following modes, it is fixed at "Lo" level.
o In pause and stop modes.

1-10 Tape Speed Selecting/Detecting

The servo IC601 is provide with the tape speed selecting and detecting functions. The tape speed can be selected during recording, but it is automatically discriminated during play.

1) Selection in recording mode
SP and LP modes alternate every time the LP/SP switch on the remote control is pressed except in the record/play and search modes, and the information is transmitted in the form of serial data from the system control µP to the servo IC. According to the data, the servo IC determines the capstan speed and sets the corresponding pin 4 (SP) or pin 2 (LP) at "Hi" level. In the record mode, pressing the SP/LP switch does nothing (except in the record pause mode).

2) Discriminating in play mode
During playback, the system control µP monitors the frequency of the playback control (CTL) signal supplied from the servo IC and switches the tape speed so that the CTL frequency becomes 25Hz. The playback CTL signal is applied to a counter in the speed detector stage via pin 56 of IC601 and pin 46 of the system control µP. The counter uses a clock pulse obtained by dividing the 4.19MHz reference signal to measure the period (frequency) of the playback CTL pulse.
The measured data is supplied to the tape speed discrimination stage. When the frequency of the playback CTL signal, fCTL, is higher than 18 Hz and is equal to or lower than 37 Hz , the tape speed discrimination stage judges that the playback tape speed is normal and holds the tape speed select signal outputs at pins 2 and 4 of the servo IC as they are. When the fCTL is 18 Hz or lower, the tape speed discrimination stage judges that the playback tape speed is slower than normal and sets pin 4 (SP) to "Hi" and pin 2 (LP) to "Lo" by transmitting 16-bit serial data to the servo IC.

In the slow, still or frame advance mode, the tape speed discrimination circuit holds the speed select outputs which have been set before these modes were entered. In this unit, the SP search speed is 5 times the normal SP playback speed, and the frequency of the playback CTL pulse is 5 times that of the normal SP playback CTL pulse. In the search mode, the CTL signal is divided down to approximately 25 Hz and then supplied to the system control µP via pin 56 (5 Vp-p) of the servo IC.
In the play and search modes, pressing the SP/LP switch does nothing.

1-11 Mode Switching

The 16-bit serial data transferred from the system control microprocessor (IC751) is used for switching the operation mode of servo control IC601. The serial data includes commands such as record, playback, slow, pause, search, fast forward, rewind, stop, cylinder on, etc. and information on the tape speed, tracking control, indexing control, artificial vertical sync phase control, etc.

Fig 1-11 shows the composition of the serial data transferred from the system control μP to the servo IC (4.6 Vp-p at pins 53 and 54).

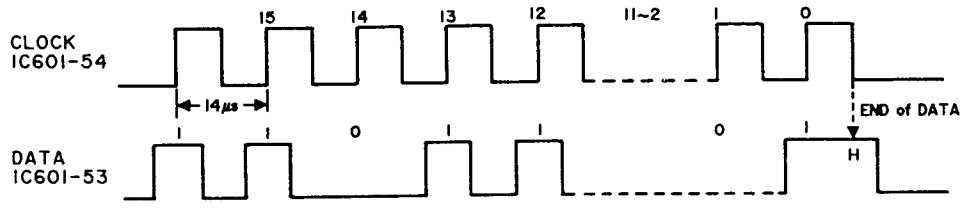

Fig. 1-11 Composition of Serial Data

1-12 Artificial V. Sync Generator

Fig. 1-12 shows the artificial vertical sync generator.

This generates an artificial V. sync pulse (V. DRIVE pulse) and inserts it into the video signal to compensate for dropout of the vertical sync signal that occurs during trick play.

The SW25Hz video head switching signal is applied to the phase shifter stage in the vertical sync generator, where it is normally shifted by 6 H and is applied to the vertical sync generator. The vertical sync generator generates the artificial vertical sync signal 3 H in width and supplies it to the H.V. sync adder stage. The H.V. sync adder stage adds the H.sync signal supplied from the H pulse oscillator to the V. sync signal, and outputs the resultant artificial vertical sync shown Fig. (c) to the luminance processing IC to add it to the video signal via pin 48 (4.5 Vp-p).

The blanking pulse generator generates two blanking pulses 6 H in width before and after the V.sync signal as shown Fig. (d). The generated blanking pulse is applied to switch S7 to add it to the vertical sync signal.

The delay time shifted by the phase shifter stage and the width of the front blanking pulse are varied from field to field according to the polarity of the SW25Hz and to the mode of trick play to minimise the vertical fluctuations of the picture. The delay time and the width of the blanking pulse are specified by the serial data transmitted from the system control μP, and they are veried within a range of 6 ± 2.5 H.

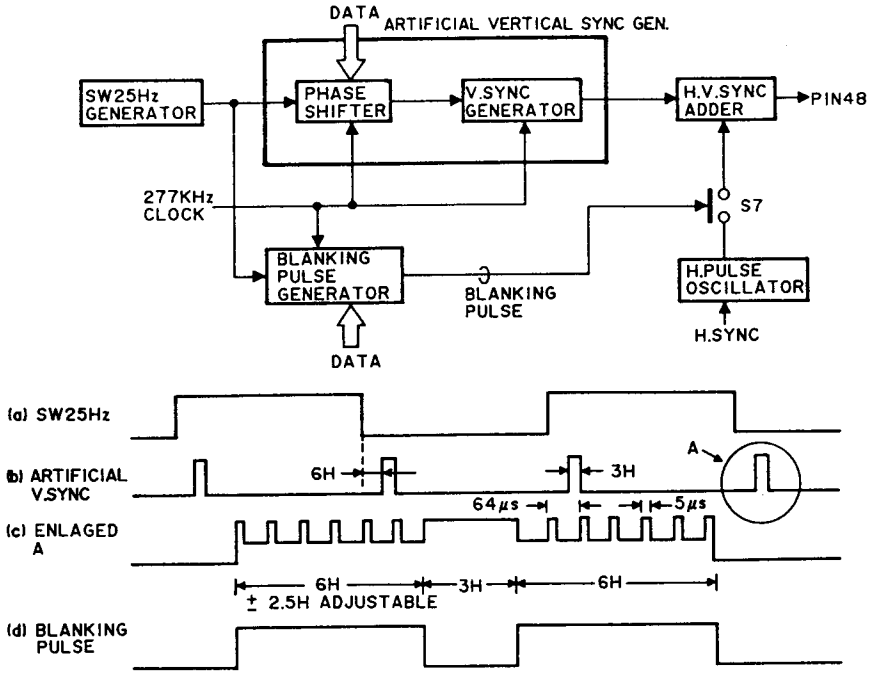

Fig. 1-12 Artificial V. Sync Generator

1-13 Manual Tracking Control

The playback tracking in this model is not controlled by the tracking variable resistor as in previous models, but by the system control microprocessor

To set the phase of tape travelling, namely to control tracking, the system control µP sends the tracking data which specifies the delay time of the reference signal for capstan phase control to the servo IC via data transmission port pin 68. Receiving the tracking data, the servo IC delays the reference signal at the digital tracking monostable multivibrator stage by the amount specified by the tracking data.

The tracking control is classfied into manual and auto tracking control.

- Manual tracking control
  The system control µP receives the tracking up/down commands from the remote control hand unit and varies the tracking data and sends it to the servo circuit.
- Autotracking control
  The autotracking µP detects the level of the video playback FM signal and varies the tracking data to be applied to the servo circuit via the system control µP so the FM envelope becomes maximum.

Fig. 1-13 shows the operation of the tracking control.
The digital tracking MM is triggered 1.84 ms before the trailing edge of REF25Hz and produces a digital trapezoid trigger pulse after a constant delay time specified by the tracking data. When triggered by the trigger pulse, the capstan phase detecter stage generates a digital trapezoid signal. As the playback CTL signal is locked to the center of the ramp of the digital trapezoid signal by the function of capstan phase control loop and the playback CTL signal follows the digital trapezoid signal, the phase of the tape travelling with respect to REF25Hz is determined by the tracking data transmitted from the system control µP. As a result, the tracking is controlled by the tracking data transmitted from the system control µP. The delay time of the reference signal with respect to the REF25Hz is initialized to the center value 18.12 ms when a cassette is inserted. The delay time can be varied in the range of approximately 13 ms in both the up and down directions by operating the tracking up/down buttons. It takes about 7 seconds to shift the tracking between the lowest and highest values when a tracking button is held depressed.

The phase of the tracking trigger signal output via pin 1 indicates the center value of the delay time at the digital tracking MM. It is fixed regardless of the tracking data and is used for the autotracking control.

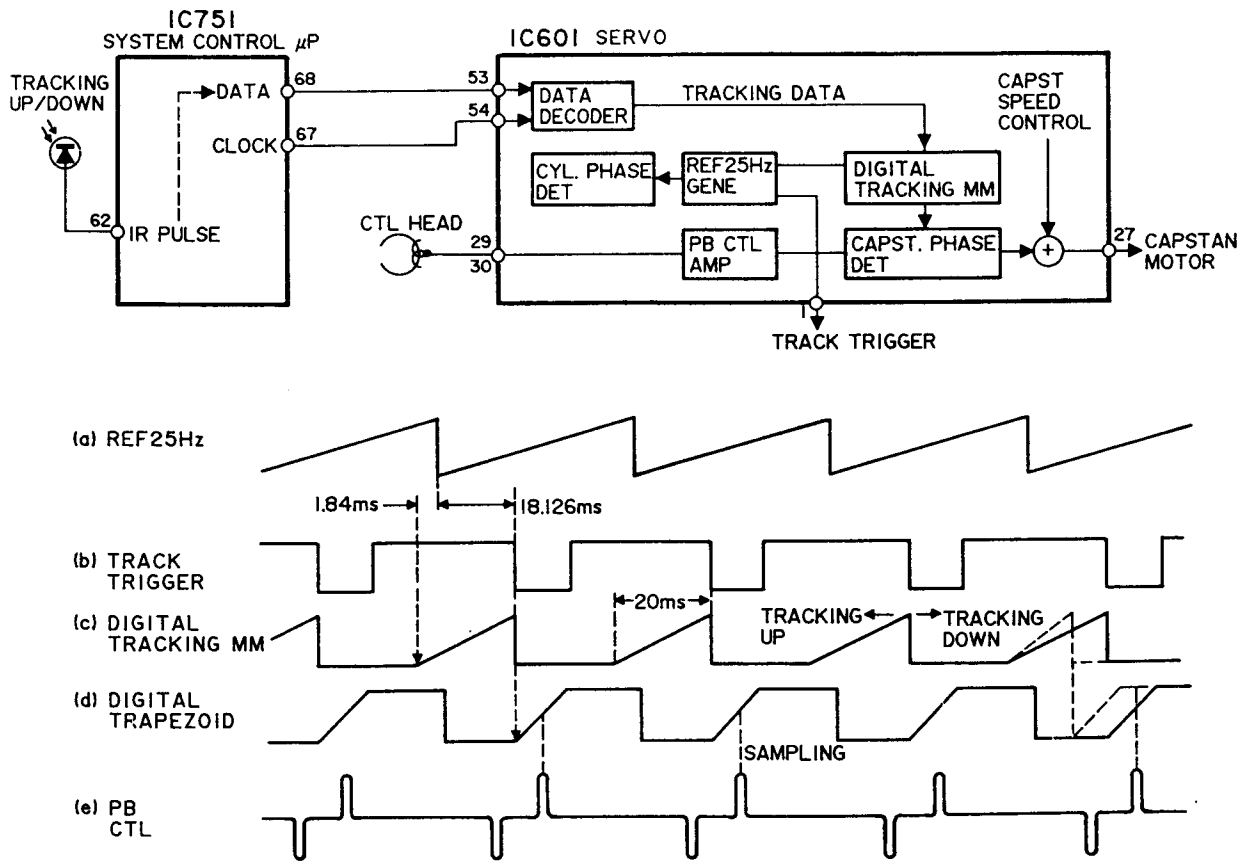

Fig. 1-13 Tracking Control

1-14 Autotracking Control

This unit (VT-M728E) features an autotracking control.
The autotracking function sets the optimum delay time automatically to the digital tracking MM stage to make the FM envelope of playback video maximum.
Fig. 1-14 shows the operation of the autotracking control.
The FM envelope of the playback video signal (0.2 Vp-p: PG902 pin is amplified by the preamp P.C.B. and Q901-3, rectified into DC level by Q604 and is applied to the input pin 5 VIDEO ENVELOPE (2.7 VDC) of the autotracking µP.

(a) Execution of autotracking

The autotracking operation is stated in two ways; manually and automatically.

Manual starting

When the autotracking button on the remote control hand unit is pressed by the user, autotracking is executed immediately after the auto start command is entered to the system control µP.

Automatic starting

The execution of autotracking is determined by the system control µP in case of;

- After a cassette has been inserted, if autotracking has not been executed yet, when the tape is played back initially.
- After the execution of autotracking has been completed, if the envelope level drops continuously for several seconds (SP: 4 sec, LP: 7 sec) by approximately 19% or more from that set by the previous autotracking operation.
- When the tape speed is switched from LP to SP during playback.

After autotracking operation has been started, to seek the optimum point where the maximum envelope is obtained, the autotracking system performs tracking-up and down scanning, and then set the tracking to the optimum point.
Fig. 1-14 (h) shows the operation of scanning.

(b) Scanning

(1) Scanning in the tracking-up direction

When the autotracking starts, the tracking data is set to the center value to set the tracking to the center. The delay time is then shortened in 462 µsec steps (to the left in the figure) from the center (starting point) to seek the maximum value of the envelope. Scanning is performed up to the range (point A) where the envelope is reduced by 10 % from the maximum envelope or the delay time reaches the limit of variation in the tracking-up direction.

(2) Scanning in the tracking-down direction

The delay time is made longer (to the right in the figure) from point A which is obtained in the upward scanning while comparing the envelope at each step.

Scanning is performed down to the point B where the envelope is 10% less than that of the maximum one or to the limit of variable range in the downward direction.

(3) Shifting of tracking to the optimum point

The tracking data is shifted to the optimum value that was detected by the scanning operation.

(c) Circuit operation

Fig. 1-14 (a) shows the configuration of the autotracking circuit.
When the autotracking is commanded to the system control µP, the µP sets pin 8 ATR START to "Hi" (t1) and sends it to autotracking µP IC901. Receiving "Hi" at pin 10, the autotracking µP prepares to start autotracking operation, and to inform the completion of the preparation to the system control µP, the autotracking µP sends "Lo" (t2) via pin 13 $\overline{\text{ATR ACT}}$ to the system control µP. The system control µP sets pin 8 ATR START to "Lo" and pin 7 ATR MODE to "Hi" (t3). By this, the autotracking µP starts scanning. To scan the tracking in the upward direction by 462 µs, the autotracking µp outputs a negative pulse (t4) via pin 21 $\overline{\text{TRACK UP}}$ to the system control µP synchronized with the TRACK TRIGGER pulse applied to pin 2. The tracking µP outputs the $\overline{\text{TRACK UP}}$ pulse once every 3 TRACK TRIGGER pulses, while checking the level of the envelope applied to pin 5.
Shifting the tracking data in the down direction is performed by outputting the $\overline{\text{TRACK DOWN}}$ pulse (t6) to the control µP via pin 22. At t scanning, to set the optimum data to the digital tracking the servo circuit via the sy µP, the autotracking µP outp $\overline{\text{TRACK UP}}$ pulse (t8) with the as the TRACK TRIGGER pulse. The autotracking µP detects tracking control currently e counting the phase differenc $\overline{\text{CTL}}$ pulse applied to pin 16 TRIGGER pulse.
After the optimum tracking h the µP sets pin 13 $\overline{\text{ATR ACT}}$ t to inform the completion of the system control µP and th control µP stops the flashin tracking indicator.

When the cassette is ejected pin 17 is shorted to ground UP/DOWN switch S142, and the µP initialises the data stor

The tracking data that has b before loading or unloading after loading and unloading. stop, fast forward and rewin tracking data set in the pla maintained.

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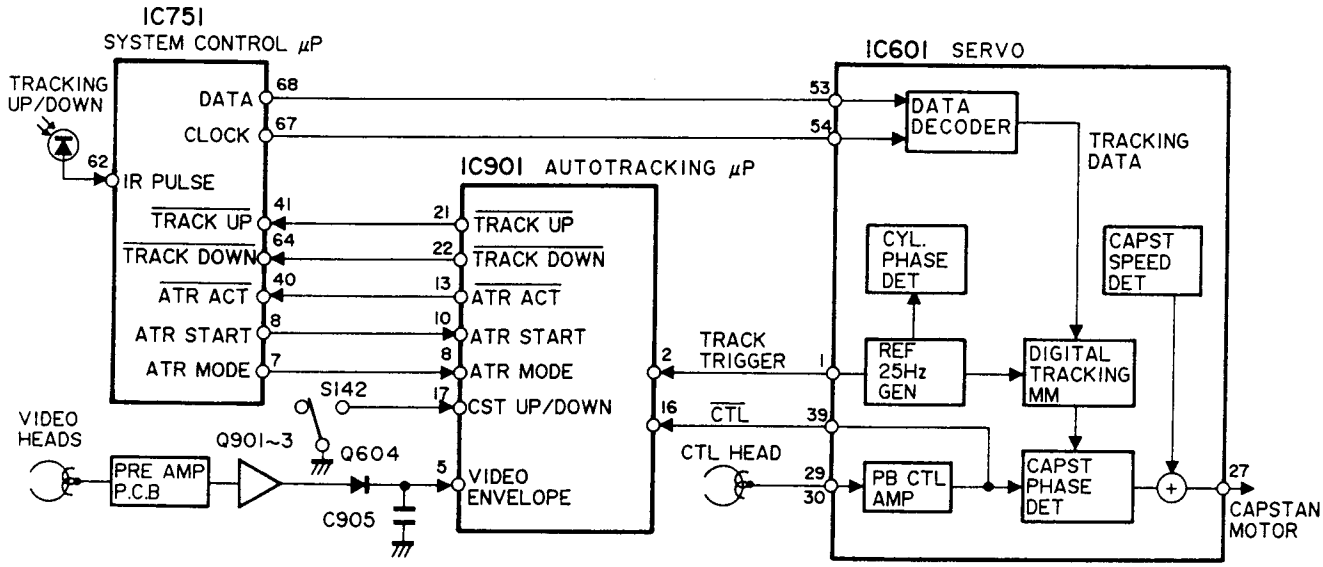
The tracking data set in the playback and trickplay modes is reset to the center value when the tape is ejected or a power failure occurs.

When the tracking up/down button is pressed during play, the auto tracking function is cancelled and the manual tracking mode is entered.

During trick play such as forward search playback, reverse search playback (double speed playback and reverse play: not provided in this unit), the manual tracking mode is entered forcibly. In the slow mode, tracking is controlled by the system control and slow driver IC (a slow driver IC is not provided in this unit).



(a) Autotracking Circuit

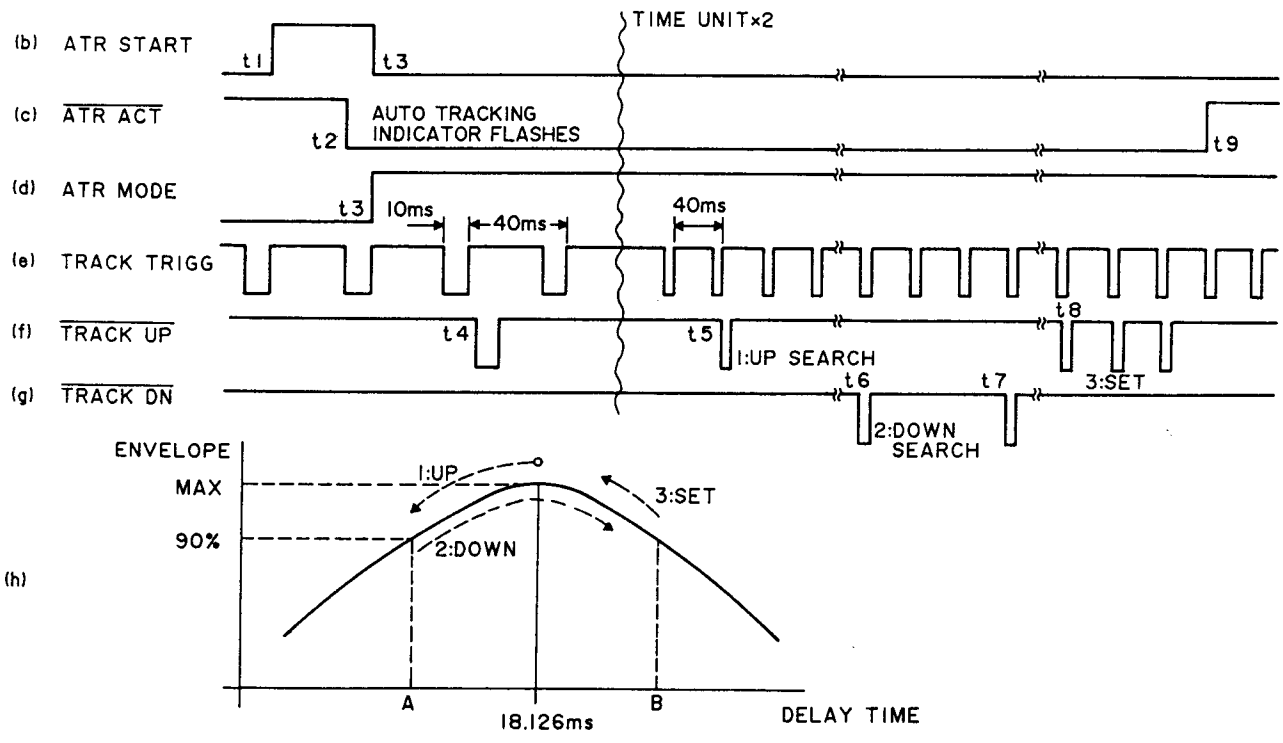


Fig. 1-14 Operation of Autotracking Control

CHAPTER 2 OTHERS

2-1 Head Cleaning Mechanism

The cleaning roller assembly comes into contact with the video heads during loading and unloading to clean the heads. Fig. 2-1 shows the cleaning roller assembly. Fig. 2-2 shows the cleaning device drive mechanism.

The end of the rack (shown in Fig. 2-2) which is installed in the z chassis loading mechanism is pressed against the cam of the drive arm. As loading progresses, the rack is pulled up and the drive arm which is pressed by the end of the rack turns conterclockwise. As the rack turns, the roller arm turns conterclockwise in the same way due to the stretching force of the roller spring and the cleaning roller comes into contact with the video heads to clean them.

Immediately before loading is completed, the cleaning roller is separated from the video heads since the cam of the drive arm is not in contact with the projection of the rack, and cleaning finishes.

As the drive arm turns counterclockwise during cleaning, the ratchet arm turns counterclockwise, and the tab at the end of the ratchet arm turns the gear at the bottom of the cam roller clockwise by appro. 60°. The top of the cam roller forms a cylinder-shaped cam as shown in the cross sectional diagram in Fig. 2-1. One end of the roller shift arm is pressed against the cam section of the cam roller by the spring force. The pressure is about 12 g. Therefore, when the cam roller turns clockwise, the roller shift arm moves up and down following the shape of the cam roller to move the cleaning roller up and down. This causes the section of the cleaning roller which is in contact with the video heads to change every time loading or unloading is performed.

The force of the cleaning roller pressed against the video heads is determined by the roller spring attached to the ratchet arm.

The cleaning roller is formed by 80 sheets of the 0.1 mm thick polyacetate, Because thin sheets are laminated, the surface of the roller is elastic. This protects the tape; the moved dust enters thin sheets and does not touch the video heads again.

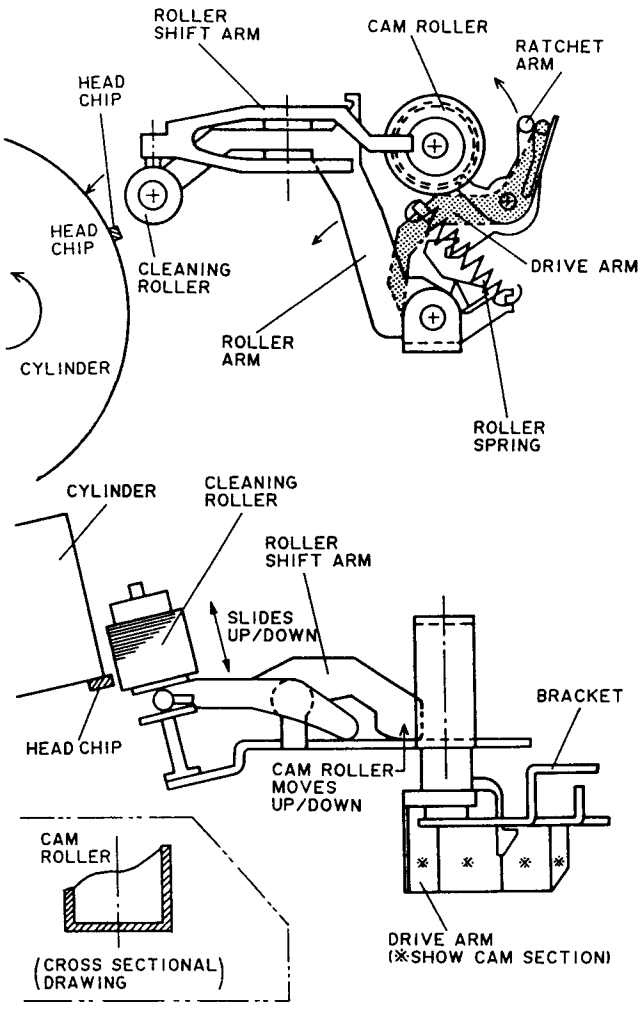


Fig. 2-1 Cleaning Roller Assembley

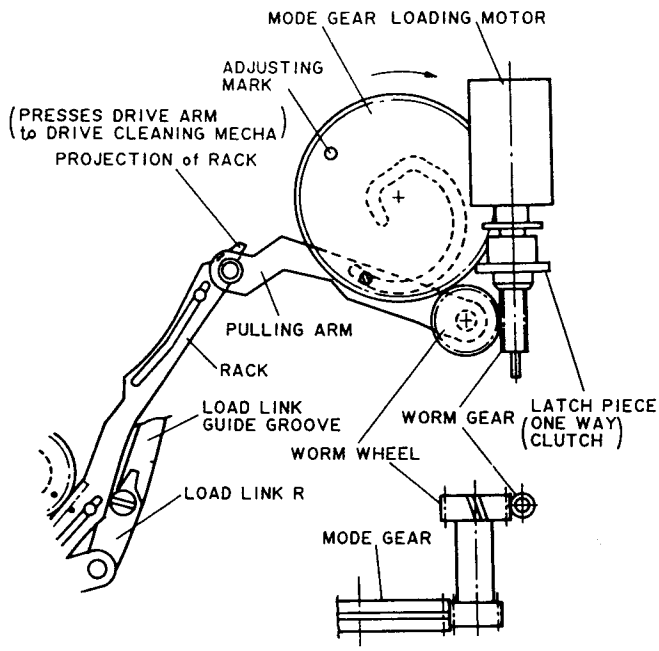


Fig. 2-2 Cleaning Device Drive Mechanism

2-2 Pin Functions of System Control μP (IC751)

Pin No.	I/O	Active Level	Abbreviation	Function
1	O	Hi	REC	Sets each circuit to the record mode.
2	O	Hi	MONITOR CUT	Inhibits the output of video signal being recorded during loading.
3	O	Hi	TRICK PLAY	Outputs "Hi" to the luminance and chrominance circuits to improve picture quality during the search and still modes.
4	O	Hi	CURRENT UP	Increases the recording current of video signal for 7 seconds after the assemble mode is released or recording is started to reduce rainbow noise occurring in the overlapped sections in playback.
5	O	Hi/Lo	VTR/$\overline{TV}$	Selects the RF signal (the aerial signal input via the AERIAL IN terminal or the output of the RF converter) to be output via the "RF OUT" terminal of the VTR. (Used for AU model)
6	O	Hi	BLUE BACK	Outputs "Hi" in modes such as OSD MENU, PROGRAMME REVIEW CALENDAR, etc. when a blue screen is displayed, and controls the OSD circuit.
9	O	Hi	LINE MUTE	Mutes the audio signal to be recorded or played back.
10	O	Hi	$\overline{POWER\ ON}$	Outputs "Lo" to activate the regulator and turn the power supplies on. Alternates between "Hi" and "Lo" every time the operate switch is pressed.
11 19	O O	Hi Hi	SEGMENT (i) SEGMENT (a)	Output segment drive pulses.
20 28	O O	Hi Hi	GRID 11 GRID 1, 4	Output grid drive pulses.
29	I	Pulse	T. REEL	Counted to display the counter reading. The period is measured to check the operation of the tape take-up reel disk is normal or not.
30 31	I O	AC AC	XC IN XC OUT	Generates a reference clock signal of 32 kHz. It is used to update the clock in models that do not use the mains frequency as the reference signal or during power failures.
32	I	Hi	$\overline{RESET}$	Initializes the μP.
34	O		Vdd	5V power supply.
35 36	I I	ANALOG ANALOG	KEY 0 KEY 1	Operation commands input pins. Receive operation commands from the ladder resistor circuis.

VOL-TAGE	0.00-0.33	0.82-1.29	1.78-2.21	2.69-3.06	3.56-4.06	4.62-5.0
Pin 35	POWER	STOP/	REC	PLAY	--	--
Pin 36	--	--	--	--	REW	F.FWD

Pin No.	I/O	Active Level	Abbreviation	Function
37	I	Lo	AFT (S CURVE)	Monitors the AFT output produced in the IF circuit, to detect the optimum tuning state.
38 55	I I	Lo Lo	REW END FWD END	Detect the rewind and forward ends of tape.
39	I	Hi/Lo	CLOCK MODE	Hi: 24-hour display, Lo: 12-hour display.
*40	O	Pulse	CLOCK (S-VPS)	Outputs the sync signal necessary to receive VPS data.
*41	I	Pulse	DATA (VPS-S)	Receives VPS data which controls timer recording.
43	I	Pulse	C.FG	1. Stops unloading when there is no pulse during unloading to prevent damaging the tape. 2. Used to count the amount of tape transported. The timing of recording restart is determined by counting up and down the C.FG signals to minimize the overlapped section when recording pause is released.
44	I	Hi/Lo	BAND MODE	Specifies receivable bands by regulating the code output from pins 47 and 48: Hi, UHF & VHF bands; Lo, UHF band.
45	I	Pulse	SW 25	1. Monitors the period of SW25Hz to judge whether the rotation of the cylinder motor is normal or not during recording and playback. 2. The assemble mode is released synchronised with SW25Hz.
46	I	Pulse	CTL	Used to detect the playback tape speed.
47 48	O O	Hi HI	BAND 1 BAND 2	The two-bit band code output via these pins selects the band.
49	O	Lo	$\overline{\text{AFC SW}}$	Enables the AFT operation of the IF circuit.
50	I	Pulse	EAROM DATA	Receives the tuning data and the timer recording programmes which have been written to the EAROM.
*50	O	Hi/Lo	LINE/$\overline{\text{TUNER}}$	Selects the audio and video input signals, the signals input via the VIDEO IN and AUDIO IN jacks or the signals demodulated by the tuner unit. The selected input signals are supplied to the video and audio processing circuits.
51	O	Lo	$\overline{\text{ENABLE (ROM)}}$ (EAROM LOAD)	Activates the data communication function between the system control µP and the EAROM
52	O	Hi	ENABLE (CG) (OSD LOAD)	Outputs "Hi" when data is transmitted from pin 54 to the character generator and enables the character generator to receive the data.
53	O	Pulse	CLOCK (S-ROM/CG)	Sync signal for transfer of data between the system control µP and EAROM, and from the system control µP to the character generator.
54	O	Pulse	DATA (S-ROM/CG)	Outputs the band code, the tuning data which designate a tuning voltage, AFT on/off data and timer recording programmes to the EAROM. Outputs data for on-screen display such as the present time, counter reading, channel number, timer recording programmes, etc.

* shows a pin provided in the CT and VPS models

<table>
<tr><th>Pin No.</th><th>I/O</th><th>Active Level</th><th>Abbreviation</th><th>Function</th></tr>
<tr><td>78

42</td><td>O

O</td><td>Hi

Hi</td><td>LOAD

UNLOAD</td><td>Drive the loading motor driver to rotate the loading motor in the normal or reverse direction and to set the mechanism to the state commanded. The state of mechanism is informed by the inputs at pins 56, 57 and 58.
<table>
<tr><th></th><th>STOP</th><th>LOAD</th><th>UNLOAD</th><th>BRAKE</th></tr>
<tr><td>Pin 78</td><td>Lo</td><td>Hi</td><td>Lo</td><td>Hi</td></tr>
<tr><td>Pin 42</td><td>Lo</td><td>Lo</td><td>Hi</td><td>Hi</td></tr>
</table></td></tr>
<tr><td>56
57
58</td><td>I
I
I</td><td>Hi
Hi
Hi</td><td>M. STATE 2
M. STATE 1
M. STATE 0</td><td>Detect the operation mode of the mechanism using the rotary mechanism state switch and determine the logic level (Hi or Lo) at pins 78 and 42.
<table>
<tr><th>Position</th><th>1
EJECT</th><th>2
STOP</th><th>3
F.F/REW</th><th>4
REC PAUSE</th><th>5
REVERSE</th><th>6
PLAY/REC</th><th>7
SLOW</th><th>TRANSITION</th></tr>
<tr><td>Pin 56</td><td>Hi</td><td>Hi</td><td>Hi</td><td>Hi</td><td>Lo</td><td>Lo</td><td>Lo</td><td>Lo</td></tr>
<tr><td>Pin 57</td><td>Hi</td><td>Hi</td><td>Lo</td><td>Lo</td><td>Hi</td><td>Hi</td><td>Lo</td><td>Lo</td></tr>
<tr><td>Pin 58</td><td>Hi</td><td>Lo</td><td>Hi</td><td>Lo</td><td>Hi</td><td>Lo</td><td>Hi</td><td>Lo</td></tr>
</table></td></tr>
<tr><td>59</td><td>O</td><td>Hi</td><td>CAPST. MODE</td><td>Outputs "Lo" to disable the capstan servo in the slow mode. In this case, pin 79 and the slow driver (not provided) control the capstan speed.</td></tr>
<tr><td>60</td><td>O</td><td>Pulse</td><td>VT</td><td>Outputs a PWM signal which regulate the local oscillator frequency in the tuner.</td></tr>
<tr><td>61</td><td>I</td><td>Pulse</td><td>AC CLOCK</td><td>Updates the clock and detects power failures.</td></tr>
<tr><td>62</td><td>I</td><td>Pulse</td><td>IR PULSE</td><td>Receives the remote control signal.</td></tr>
<tr><td>63</td><td>I</td><td>Hi</td><td>SYNC.DET</td><td>Monitors presence(Hi)/absence(Lo) of the sync signal to judge whether a channel is tuned or not.</td></tr>
<tr><td>65</td><td>I</td><td>Hi</td><td>CST UP/DOWN</td><td>Detects the insertion or ejection of a cassette and the completion of loading of the cassette and controls turning on/off the capstan motor to perform cassette loading or unloading.</td></tr>
<tr><td>66</td><td>I</td><td>Hi</td><td>TAB</td><td>1. Enables recording when the tab is intact and "Hi" is input.
2. Ejects the cassette automatically when its safety tab is not in place and timer recording is set.</td></tr>
<tr><td>67

68</td><td>O

O</td><td>Pulse

Pulse</td><td>CLOCK(S-SRV)

DATA(S-SRV)</td><td>Outputs a sync signal for data transfer.
This signal times the transfer of the data at pin 68.
Outputs control commands for the servo IC. The control commands include PB, REC, REV, F.FWD, SLOW, PAUSE, CYL.ON, SP, TRACKING DATA, ARTIFICIAL V.SYNC PHASE, etc.</td></tr>
<tr><td>69</td><td>O</td><td>Hi</td><td>$\overline{\text{PLAY}}$</td><td>Sets each circuit to the play mode.</td></tr>
<tr><td>70</td><td>O</td><td>Hi</td><td>REVERSE</td><td>Sets the rotation direction of the capstan motor to reverse.</td></tr>
</table>

Pin No.	I/O	Active Level	Abbreviation	Function
72 74		AC AC	OSC 1 OSC 2	Generate the system clock signal of the µP. The frequency is approximately 4MHz.
71 75 76	 I I	Lo Hi Lo	Vss Vref V.DISP	Pin for ground. Reference voltage input pin. (not used) -30V negative power supply.
77	O	Hi	CAPST. BRAKE	Applies approx. 1V to the speed control input of the capstan motor driver when braking the capstan motor in a mode other than recording and playback. The capstan motor is braked when a speed control voltage is applied to the input between 0.6 V and 1.75 V DC.
79	O	Hi	CAPST 0	Determines the power supply voltage to the capstan motor driver to set the tape speed in the fast forward and rewind modes.
80	O	Hi/Lo	SP/$\overline{\text{LP}}$	Supplies information on the tape speed (SP or LP) selected or detected to each circuit to switch the amount of preemphasis and deemphasis of video and audio.
*80	O	Hi	PRESET	Outputs "Hi" during the preset mode and the on-screen display mode when OSD MENU, PROGRAMME REVIEW, CALENDAR, etc. is displayed. "Hi" lets the monitor TV display the output of the VTR.
7	O	Hi	ATR MODE	Enables the autotracking µP to perform autotracking operation.
8	O	Hi	ATR START	The leading edge informs the autotracking µP to provide for starting autotracking operation, and the trailing edge lets the operation start.
40	I	Lo	$\overline{\text{ATR ACT}}$	Judges that the autotracking µP is searching the optimum point for tracking and flashes the autotrack indicator while "Lo" is input.
41	I	Lo	$\overline{\text{TRACK UP}}$	Advances the phase of the reference signal used for capstan phase control by one unit when a trailing edge is input.
64	I	Lo	$\overline{\text{TRACK DOWN}}$	Retards the reference signal by 462 µs when a leading edge is input.

* shows a pin provided in the CT and VPS models

2-3 Pin Functions of Character Generator (IC1401)

Pin No.	I/O	Active Level	Abbreviation	Function
1	O	Lo	BUSY	"Lo" informs the system control μP that the character generator is ready to receive data. Not used.
2	I	PULSE	CLOCK(S-CG)	A sychronizing signal necessary to receive data.
3	I	Hi	ENABLE(S-CG)	"Hi" enables for the IC to receive data from the system control μP.
4	I	PULSE	DATA(S-CG)	Data to be received by the IC. The data includes the character code, position where the character is to be displayed, character size, operation command, etc.
5	I	Hi	B+	Power source input pin.
6	O	AC	CLOCK OUT	Outputs the signal generated by the LC oscillator.
7 8	O I	AC AC	LC OSC O LC OSC I	Generate a clock pulse which specifies the length of the dot. The characters are composed of dots and the horizontal size of the character depends on the oscillator frequency.
9		Lo	GND	Gounds the IC.
10 11	I O	AC AC	XOSC I XOSC O	Generate a system clock.
12 13	I I	PULSE PULSE	$\overline{\text{V.SYNC}}$ $\overline{\text{H.SYNC}}$	Used to synchronize the character with the video signal to which the character is to be added.
14 15	I I	DC DC	VCL VBL	Specifies the clip (white) level of the character signal to be added to the video signal. Specifies the black level of the character signal.
16	I	Hi/Mid	VVL	Specifies the video output level at pin 17: "Hi", 2 Vp-p; "Mid", 1 Vp-p.
17	O	AC	VIDEO OUT	Outputs a video signal alone, a video signal to which characters are added or an OSD menu composed of characters only.
18	I	AC	VIDEO IN	Receives the video signal to which the character is to be added.